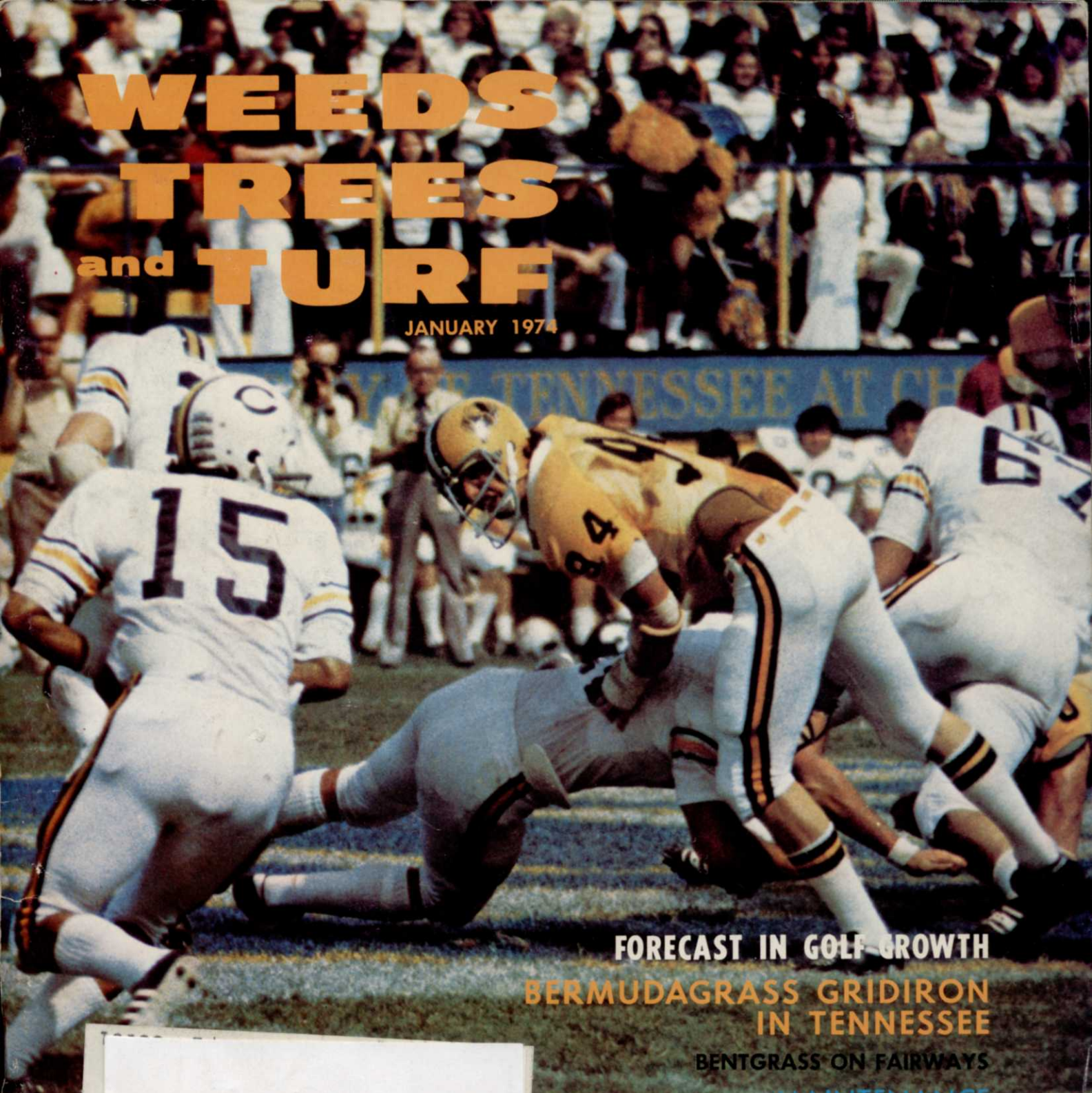
WEEDS TREES and TURF

JANUARY 1974



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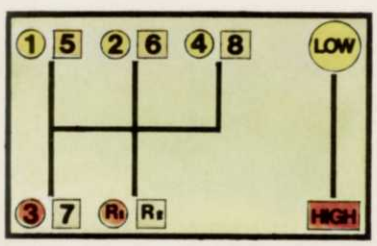

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WEEDS TREES and TURF®

"Serving The Green Industry"

Volume 13, No. 1 January, 1974

What's Happening In Golf Development 10
Harry C. Eckhoff, senior consultant, National Golf Foundation and a perennial guest author reports on golf development.

Forward Pass For Bermudagrass 12
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Golf Cars: Private vs. Club Ownership ..... DD
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Nine Points For Smooth Running Engines ..... FF
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Action on turf is captured in this clencher game which saw the University of Tennessee at Chattanooga down Southern Mississippi. Details on how the turf holds up under this kind of torture are found on page 12.

THE COVER — Golf Car & Turf Vehicle Care
Ray Smoyer, superintendent at Oakwood Club, Cleveland (r) talks shop with Bil Montague, assistant superintendent. Bud Lindsay, mechanic, checks on mower parts before the season starts. A workhorse on this course is the spray rig mounted on this Cushman turf vehicle.

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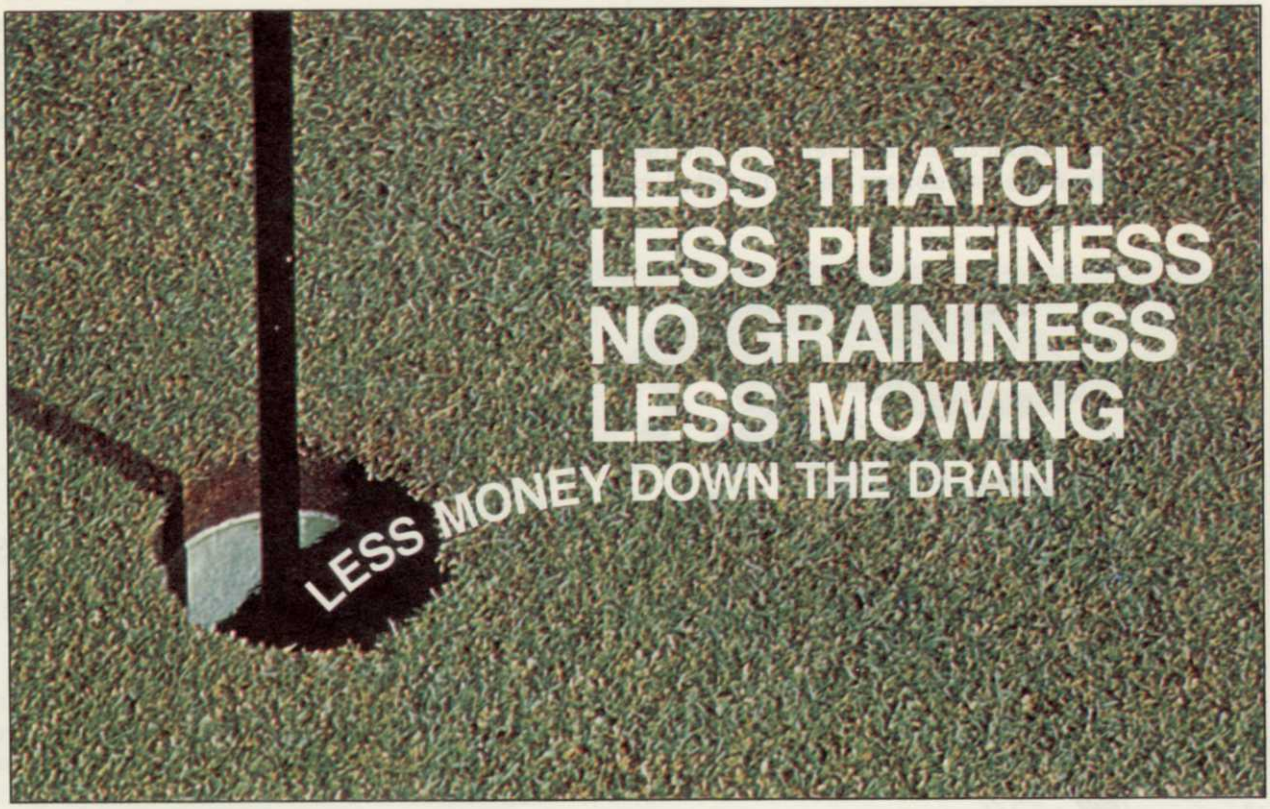

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Editorial

People Power—An Energy Source

The biggest challenge we have this year is keeping closer contact with our saltatorial government. Events which marked 1973 have had a decided effect on our leadership in Washington. Much of what they held as cornerstones to democracy has either crumbled or developed gaping fissures. Rising prices under static controls, alleged food shortages, dollar devaluation, political party intrigue and more have virtually destroyed credibility in government as it once existed.

On top of this we are now faced with shortages in energy — oil, gas, electricity. Government, rather than permitting industry to solve the situation in an economy where demand meets supply, has once again grabbed the tail of the dog. Instead of governing best by governing least, the Washington machine has loosened the threat of gasoline and fuel supply rationing on the constituents. This may seem logical to shell-shocked politicians; it may even have appeal. But to the consumer, it breeds more distrust, more controls, more belt-tightening and the whole idea of rationing has a negative connotation.

Rationing of any sort represents a major energy drain. Brainpower and manpower concentrated here is counter-productive. The average consumer would far rather see tax dollars being invested in finding alternative sources of energy. The costs to execute an effective rationing program are astronomical. None of it adds a gallon of gasoline or a kilowatt of electricity to the total. Our experience with the debacled administration of wage and price controls would indicate that just the opposite is true. About the only thing we may buy is a little time, and scant little at that.

The Green Industry can do much to change this deteriorating situation. It is we who are at stake. Our businesses and occupations will suffer first and most drastically unless positive action is taken, and fast. Picture a tree care business without the mobility of trucks. Weed control might be done with two-gallon sprayers, but it is economical when herbicides are delivered via trucks. Commercial turfgrass care will result in nothing short of a cow pasture unless sophisticated mowing equipment and other items of a turf maintenance package are employed.

What can we do? Individually we can write letters to congressmen and senators. A letter from each reader of this magazine will increase the feedback in Washington by many thousands. If you don't believe it, try it. Tell your representative what he should be doing for you the voter,

(continued on page 28)

The Green PARK Rabbit symbolizes the fast start and seeding vigor for which PARK variety Kentucky bluegrass is famous. It is the registered trademark of the Northern Minnesota Bluegrass Growers Association . . . the original producers of PARK.

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For Land's Sake

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Government News / Business

Chalk up another goal met by the American Sod Producers Association. The Department of Labor has ruled that sod production and installation are an "agricultural enterprise." This means that OSHA regulations which apply to agricultural activities will also cover sod. Previously, the law was somewhat vague as to whether sod production and installation would be agricultural or construction or just what.

Purchase of the inventory and name of the F. W. Bolgiano & Co. by the Vaughan-Jacklin Corporation is now completed. Gager T. Vaughan, president, says V-J has also agreed to acquire the Michigan State Seed Company. Terms and acquisition price of neither transaction were disclosed.

Retail and wholesale price increases on Agrico consumer lawn and garden products have been announced by the Bishop Company, effective Jan. 1. Reason? The sharp jump in the costs of urea and diammonium phosphate, both basic ingrediants. Pre-season bookings will be filled from inventories of products purchased and manufactured at lower cost, says Agrico.

Club Car, Inc. of Augusta, Ga. has been acquired by Johns-Manville Corporation. It will become part of J-M's agri-turf business.

Demand for heavy-duty co-extruded plastic shipping and storage bags will increase by 10 percent in 1974, forecasts Arthur A. Kukla, general manager of U.S. Industrial Chemicals Co. Much of the increase will go to agricultural and chemical packaging. Demand is bullish in bags for fertilizer, bark chips, ammonium nitrate, peat, gravel, compost and other products.

Another purchase...American Motors Corporation of Detroit has agreed to purchase all of the outstanding stock of Wheel-Horse. An undisclosed amount of Am. Motors capital stock and cash is part of the deal. Wheel-Horse will be operated as a subsidiary of the number four automobile manufacturer.

A speeded-up depreciation schedule on new machinery can be used to good advantage if you expect future annual earnings to fall short of earnings in 1973. According to John O. Early, an ag. economist from Idaho, new machinery bought in 1973 may gain a tax savings by claiming a first-year depreciation amounting to as mcuh as 36 percent. Might be a good idea to discuss double declining balance (DDB) with accounting and tax wizzards.

Point to Ponder. It's been said we save two to four percent of our nation's energy by moving the clock one hour ahead into Daylight Savings Time. Could we save double that amount of energy if the clock were moved ahead two hours?

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The first time a turf expert sees Fylking and he gently tests the turf, lifts a swatch and examines the root system, and closely scrutinizes the low-growing, 90-degree side angled leaves, please notice the subtle smile that crosses his face. This is the countenance of the wine connoisseur who has wet his lips with classic vintage, the man who recognizes the truly classic beauty of the Venus de Milo, the research agronomist who has spent years seeking the perfect turf and now views Fylking. Once he has, he wants to know more about this obviously elite Kentucky bluegrass. This man will appreciate knowing Fylking has received overall superior disease-resistance ratings from every major university and institution where tested for leaf spot, stripe smut, stem rust and leaf rust. When he examines the technical brochure he will smile again. Fylking is not perfect, but it's the closest of any. Fylking. It's a name you can't forget.

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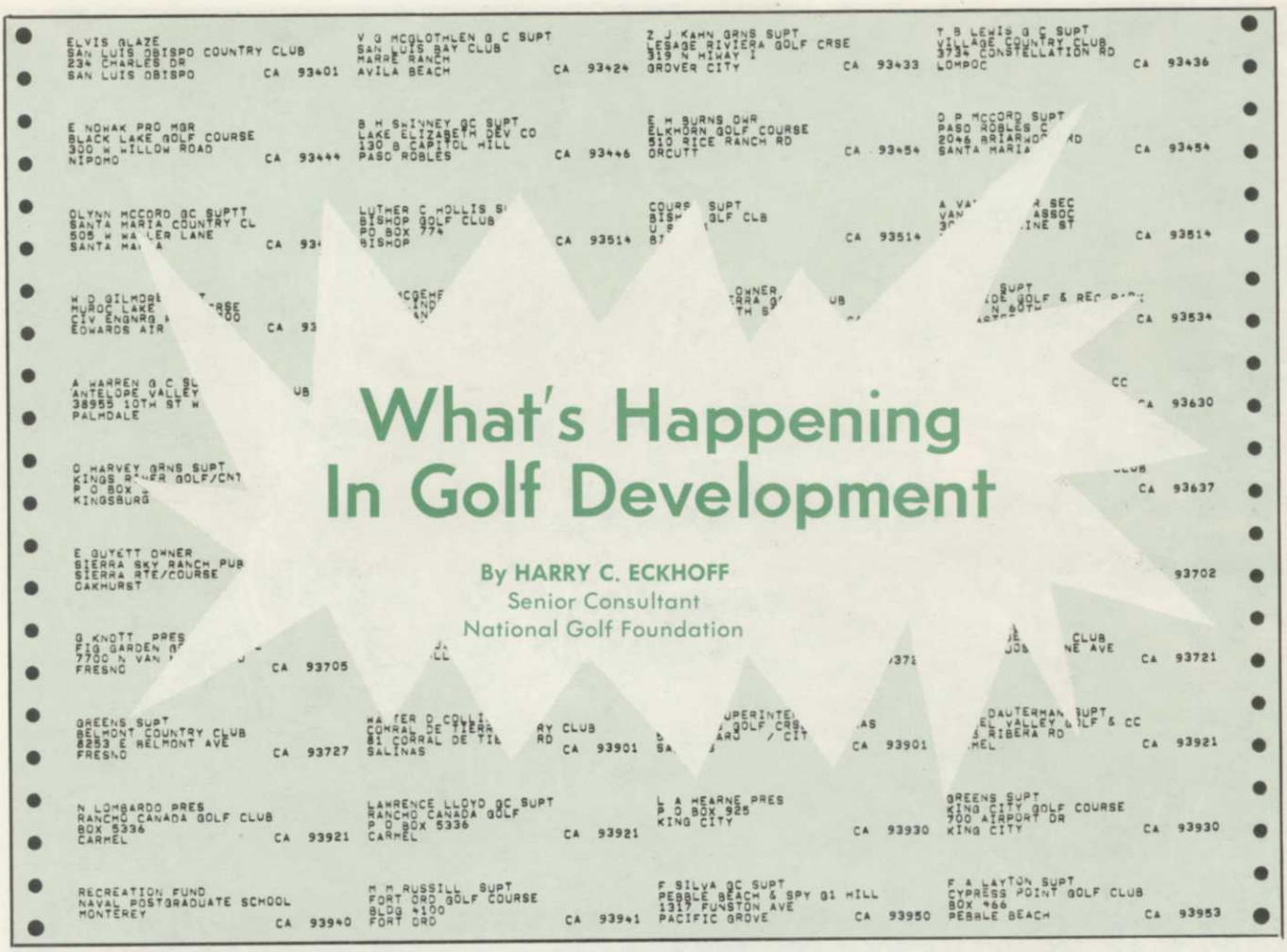

What's Happening In Golf Development

By HARRY C. ECKHOFF
Senior Consultant
National Golf Foundation

DURING the past decade 3900 new golf courses including additions to existing facilities have opened for play throughout the United States. Golf course development is continuing at a very stable pace.

The number of new golf course openings during the 10 year span beginning with 1964 ranged from over 500 in 1965 to 266 in 1972 resulting in a yearly average of 390 courses. New course openings for the year just ended (1973) were 322. A breakdown of these openings by types is shown in Table 1.

Operationally, golf courses fall into one of the following categories: private, semi-private/daily fee and municipal. An analysis of the 322 new course openings for 1973 is in Table 2.

A study of the golf facility growth pattern reveals that the development of short courses (par-3's and executive layouts) is leveling off. During the last seven years the total for such new courses opening throughout the nation annually has ranged from 37 to 48 (46 in 1973).

The leading states with new golf course openings in 1973 were Ohio (34), Michigan (25), California (23), Florida (21), Texas (17), Colorado (16), Tennessee (14), Iowa (13) and North Carolina (11).

Probably the most startling statistic gleaned from the 10 year golf facility development study is the great increase of golf courses associated with land development projects. NGF records indicate that at the beginning of the 10 year span (during 1964) only 16.3% of all the golf courses built were a part of land sales, new planned towns, resort and convention facilities, etc. For 1973 the figure had soared to 40.68%.

And the rate is increasing! Of the total courses now under construction in the nation, 58.97% are reported to be a part of real estate ventures. States that report over 80% of new golf projects in this category include Arizona, Colorado, Florida and Oregon. For Alabama and California, it is 70% or more. A recent directory of Florida real estate developments lists the names of 85 projects where developers are now selling homes or condominiums associated with golf facilities that are already in play.

Table 1. Course openings for 1973

TYPE	NEW COURSES	COURSE ADDITIONS
Regulation	178	98
Executive	21	9
PAR-3	9	7
	208	114

Table 2. Analysis of course openings

TYPE	PRIVATE	DAILY FEE	MUNICIPAL
Regulation	76 (28%)	149 (54%)	51 (18%)
Executive	3 (10%)	25 (83%)	2 (7%)
PAR-3	3 (18%)	8 (50%)	5 (32%)

WHAT'S AHEAD

With 290 new golf courses or additions to existing facilities now in some stage of construction in the nation, 1974 should be another normal year for golf course development.

Florida leads with 31 golf courses now under construction followed by

(continued on page 56)

Light touch, with turf tires or without.

Myers TurfLine Sprayers give you a "light touch" all over the course in models with tires or without. The TL12TMG (shown above) is our versatile, new, tractor mounted boom sprayer. It features Myers 12 GPM Du-All Piston Pump, a 100 gallon fiberglass tank and 21′ fairway boom. Tank also has sight gauge and paddle agitator. This "light touch" sprayer, without wheels, is only one of many Myers TurfLine units that are especially designed for golf course maintenance. Other Myers TurfLine sprayers with wheels are available with high flotation tires in dual wheel and four wheel models. For details, call your Myers TurfLine dealer or send coupon for free catalog. Myers TurfLine Sprayers. To make your job easier, help speed up your work, keep the course looking great and let you stay within budget.

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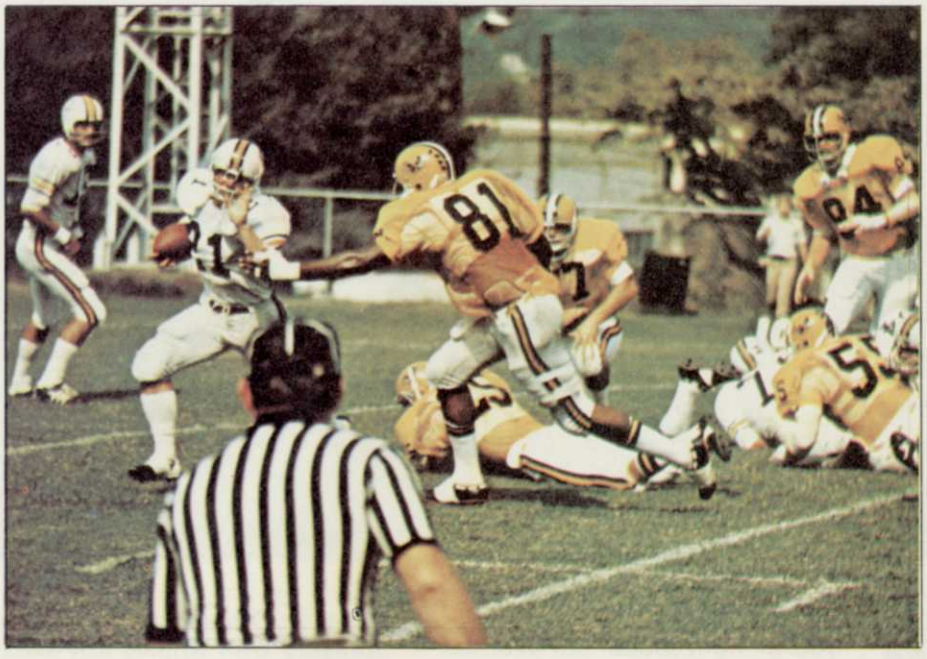


When cleats dig in with the pressure that a 285 lb. player can exert, turf would come up unless anchored by good turf systems. Action like this (at left) puts any kind of turf under rough treatment. The U.T.C. fans and players expect to see turf like this (middle) all the time. We had the gridiron in excellent condition for the Homecoming game. Bermudagrass

WTT COVER STORY

FORWARD PASS

By CHARLES PYRON

Superintendent of Campus Services
Univ. Of Tennesse At Chattanooga

THE U.T.C. MOCCASINS expect turf on Chamberlain Field for home games and they were not disappointed in 1973. Homecoming and our first home game was Saturday afternoon, October 6. The grass turf was like a Bermuda carpet, without a weed or bare spot in sight. The markings were clearly visible and new goal posts were being used for the first time. This year's homecoming brought Southern Mississippi to challenge the Moccasins, which they did very successfully with a score of 42-7.

The newly spruced-up stadium was full, the field was painted with new designs, and Joe Morrison, a former New York Giant, made his debut as coach.

The near perfect condition of the grass was the culmination of a three year program to develop tne best sports field possible. When I came to U.T.C. in August of 1970, this field was still trying to recover from its 1968 renovation. And, artificial turf had been ruled out because of cost.

A transplanted cotton grower with degrees in agriculture (B.S.), ornamental horticulture (M.S.), with special emphasis on landscape design and nursery management, I learned to grow grass when I was working in the landscaping business. To be sure that I used current technology, I sought the services of a turf consultant. Jim King, of Regal Chemical Company in Atlanta, has been instrumental in setting up our fertilization and weed control program. He also advised us on cultural practices and equipment purchases.

Common Bermuda is a good grass for the Cnattanooga area. Even with our elevation, we get too much heat in July and August for the bluegrasses. Bermuda hybrids do not recover fast enough to take the rough beating of home games over a two month period. And, sometimes local high school games are played at night after the afternoon U.T.C. games.

Since Bermuda turns brown after the first frost, whicn can be anytime after October 15, we color the grass to keep it looking naturally green for the remainder of the season. Our field is 1¼ acres or 56,000 square feet. Eight gallons of Vitalon will cover the field using one gallon of colorant for every 25 gallons of water. The coaches, players, and fans have expressed their appreciation of the field.

The photographs with this story were taken on October 6, before the frost discoloration, and the grass is shining in its natural color. The field is decorated with a typical latex-based paint mixed special for our school colors. It is applied on a one-to-one basis when the grass is wet, and to dry grass on the basis of one gallon of paint to two gallons of water. We have never experienced any noticeable damage to the grass from either the dye or the latex paint.

Normally, the latex paint is applied only once at the one-to-one basis and touched up if needed before each game at tne two-to-one rate. In 1972, I had to change the center design. Even after blocking out the original one and painting a new design over it, the grass looked good as new the following year. Normally, the field is dyed at least twice after frost discoloration begins.

Tnat is enough about the show. Now, to tne detailed part of my turf management program.

THE ROOT SYSTEM HOLDS THE TURF

There would not be much to look

turf takes punishment, but comes back quickly. Our yardage lines are marked with a machine like this (right). Just prior to a big game we make a final check to see that all likes are marked. Careful attention to details results in a playing field that beckons for action.

FOR BERMUDAGRASS

at unless proper attention was given to what happens in the soil. Without a deep root system, shoe cleats would lift out too much grass and leave the field a mass of bare spots. Or, the action would damage the surface to the extent that the shallow rooted grass could not recover.

A soil analysis is made every February so that we can determine early our maintenance needs for the year.

Even though 6.0 to 6.2 is considered a good pH range for Bermuda, we find that our grass continues to perform well even though the pH has been around 7.0 for the past two seasons. For this past season our soil analysis indicated an adequate level of phosphorus (P) and potash (K). For that reason, we used only nitrogen as Nitroform 38-0-0 in June, July, August, and September at the rate of 200 pounds per acre or an equivalent of about seven pounds of N per 1,000 square feet. Our peak growing periods for Bermuda are July and August, consequently, by the middle of September the grass is thick and green—ready for the first home football game. Nitroform has been successfully applied without any damage to the turf due to the slow release quality.

Equally important as nitrogen to grass color and health are the micronutrients, especially iron. We apply these so called vitamins in liquid form during the latter part of the growing season for a green-up before the football season. Iron is essential to root growth in combination with nitrogen. Multigreen happens to be the one we usually use because of its iron content; and it also contains sulphur, copper, manganese, and zinc.

To relieve soil compaction and to improve water and air movement the Jacobsen Core Aerifier is used monthly June through September. The nitrogen is applied after aerification. The cores are dragged in, using equipment fashioned from chain link fencing. Core aerification not only assures better fertilizer coverage, it moves the nitrogen into the root zones faster. It also gives the effect of sprigging by broadcasting the cores. Since Nitroform is nonleaching, we think this gives us quicker green-ups.

With 50-52 inches of annual rainfall, water is a problem most years only in July and August. We use two-inch aluminum pipe irrigation system and put down 1½ to 2 inches of water when needed. We believe it is better to water thoroughly once rather than lightly and more often. Deep water penetration encourages a deeper, stronger root system.

SPRING IS THE TIME TO RENOVATE

The Blue and Gold game winds up spring football practice about April 20. At this time, spring renovation begins which is the first step in putting the turf in top condition for the fall season. The practice field is used for the spring football workout except for the intra-squad game.

Since soil tests are made in February we already know pH and nutrient requirements. First we dethatch to get the dead matter away from the soil surface. When mowing, clippings are not collected, consequently, thatch buildup can be quite heavy. Top dressing follows to smooth up the soil surface.

We lose some turf every season, so bare spots are filled in with grass plugs. The practice field, on another part of the campus, supplies the needed sod. We roll lightly so as not to add to compaction.

This is the time of the year we would add balanced fertilizer if the soil test indicates a need for P and K. Also, it is the time we would cor-

(continued on page 62)

TREE CARE: HELPING NATURE WITH SCIENCE

By D. I. DODDS

General Manager

J. J. Mauget Co.

DURING the past decade, much effort has gone into the struggle to halt Dutch Elm Disease. It now becomes obvious that there is no shortcut to a solid, well-rounded program of diseased wood eradication, preventive insect and fungus control and an alert system of detecting and treating trees which have recently been infected.

Highly qualified and motivated plant pathologists concerned with this disease recognize the complexities of the task. Indeed, it is these complexities which do not lead to quick statistical conclusions. Although great progress has been made, proof of control still lies in the predictability and repeatability of tests.

In order to add perspective to current ideas about chemotherapy (the treatment of internal disease by chemical reagents) for trees by trunk injection, let's review what has already taken place. More than 25 years has gone into the development of the Mauget Tree Injection Process.

The January 1958 issue of WESTERN FRUIT GROWER carried an article "Forced Feed For Trees" by J. J. Mauget. He was an affable agricultural consultant specializing in the feeding of plants. He became interested in the possibilities of plant injection feeding after receiving intravenous nutrition in a hospital. Although he later learned that this idea had been around for 500 years, he set about to produce a simple yet effective injection process. The magazine article illustrated both gravity and pressure (up to 40 psi) equipment utilizing feeder tubes. Nutrients were introduced into the xylem tissue without removing tissue by drilling. It was also pointed out that better control of dosage level was needed to avoid defoliation.

In the early sixties, a Mauget capsule was developed. This capsule was pressurized up to 8-10 pounds by compression at time of use. It was placed at intervals of four to six inches around a tree's circumference. Tests showed that a greater amount of nutrients and other systemic materials could be introduced without defoliation or leaf burn than when introducing smaller amounts of material at fewer injection points.

Bidrin Capsules for control of Elm bark beetle, the vector of DED, were registered for a closed system pressure capsule in 1964. This was to be used as a preventive measure. As with many things for which there is a choice between life and death, misapplications appeared. In many cases this preventive measure was frequently used on diseased trees without tissue testing first.

Seven or eight years later it was possible to determine who had continued to use this insecticide application and why. Through these users and their results, we can now demonstrate insect control against a broading range of insects.

Today, the pharmaceutical approach to tree care is under the careful scrutiny of the Environmental Protection Agency. As a small company, we find delay in registration a heavy burden. But you learn to recognize that EPA has an awesome responsibility. As an example, it took seven years of field testing and restricted marketing of one of our products before full registration was granted. During that time, we were asked to provide data where product use on the same trees was accomplished three or more consecutive years without permanent damage. This careful analysis is the same type as the Federal Drug Administration takes in evaluating a compound for human medication.

Much of the current status of the use of benomyl fungicide for combating DED has been widely reported. The only presently approved method of trunk injection is a water suspension of the fungicide placed in a 65 ml (2 oz.) non-pressurized Mauget capsule. It in turn is connected to a feeder tube spaced at a two inch interval to another feeder tube — around the circumference of the tree.

The initial object was to evenly distribute the fungicide to the upper branches and twigs without permanent damage. Dr. Eugene Smalley, plant pathologist, University of Wisconsin, arrived at this procedure. Reasonably broad field testing was accomplished in 1971. The results justified registration and useage on a broader scale in 1972 and 1973. This was the initial step, one that would ultimately result in a more refined and effective method.

Utilizing the decade of experience, the Mauget Company has now developed a solubilized form of benomyl. It has been field tested on a broad range of pathogens and trees with particular attention to the observation of any phytotoxic effects. Although it is currently not available, this product has been issued the trademark Fungi-Sol systemic fungicide. When approved, it will be packaged at controlled dosage levels in the regular Mauget closed system pressurized capsules. Concentrations of active ingredients

(continued on page 49)

The gypsies are coming

--ready or not!

Be ready this year with THURICIDE – the proven microbial insecticide!

WIDELY USED AND PROVED—Thousands of forest acres in the northeastern United States area have been treated with Thuricide for control of gypsy moth larvae. Professional arborists and nurserymen have used it with outstanding success. It is the leading microbial insecticide—worldwide—for protection of agricultural food and other crops.

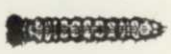
COMPATIBLE, READY-TO-MIX LIQUID—Thuricide comes to you in concentrated liquid form. There are no tedious mixing problems, no danger of nozzle clogging. Thuricide is highly stable, nonphytotoxic to foliage, and can be mixed with other insecticides.

THURICIDE IS SCIENCE'S ANSWER to the professional tree man's problem of gaining *effective control* over gypsy and oak moth larvae—without affecting other forms of life. Thuricide's powerful active ingredient *(Bacillus thuringiensis)* is derived from nature herself. It brings *sure death* to leaf-eating worms, yet there is no risk of toxic drift or residues.

ATTACKS WORMS' GUTS—Once worms ingest Thuricide-sprayed leaf, their digestive systems are quickly destroyed, feeding stops, and death is *inevitable.* Even if worms seem to hang around after spraying, no worry, they're actually starving! Man, birds, beneficial insects and pets, however, are left untouched by Thuricide's unique and selective "target action." *For full particulars, see your Thuricide distributor. Or write Sandoz-Wander, Inc., Crop Protection Dept., Homestead, Florida 33030. Or call (305) 248-4671 collect.*

USED NATIONWIDE BY ARBORISTS FOR CONTROL OF THESE LEAFEATERS, TOO!

OAK MOTH LARVAE
Ca./trees & shrubs



CANKERWORM (Inchworm)
U.S./trees & shrubs

RED-HUMPED CATERPILLAR
Ca./trees & shrubs

FALL WEBWORM
U.S./trees & shrubs

TENT CATERPILLAR
U.S./trees & shrubs

SANDOZ **Thuricide®**

Number One Name in Microbial Insect Control!

For More Details Circle (129) on Reply Card

"THE RIGHT APPROACH" TO GOOD TURF
CHIPCO TURF HERBICIDE MCPP
CHIPCO TURF HERBICIDE MCPP
CAUTION: Keep Out of Reach of Children
"THE RIGHT APPROACH" TO GOOD TURF
CHIPCO TURF HERBICIDE "D"
CHIPCO TURF HERBICIDE "D"
CAUTION: Keep Out of Reach of Children
CHIPCO THIRAM 75
CHIPCO THIRAM 75
TURF FUNGICIDE
CAUTION:
CHIPCO SPOT KLEEN
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Do NOT Store with Foodstuffs
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For the Control of Certain Broadleaf Weeds in Newly Planted Grasses for Sod or Seed Production
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"THE RIGHT APPROACH" TO GOOD TURF
CHIPCO MICROGREEN LIQUID
CHIPCO MICROGREEN LIQUID
A blend of metal organo complexes of iron, zinc, manganese, and copper for the correction of turf nutritional deficiencies
CAUTION: Keep Out of Reach of Children
CHIPCO SPREADER-ACTIVATOR
CHIPCO SPREADER-ACTIVATOR
FOR TURF and ORNAMENTAL SPRAYS
CAUTION:

Buy a Chipco® something, get a Chipco® something else absolutely free.

Why are we doing this?

To help you save money. But, we have something else in mind, too.

Chipco is the best group of products you can use for an effective turf management program.

And we know once you use Chipco anything, you'll soon be using Chipco everything else.

If you buy:	You get free:
24 lbs. Chipco Spot Kleen	1 gal. Chipco Turf Herb. MCPP ($ 9.85 value) Or 6 lbs. Chipco Thiram 75 ($ 6.84 value) Or 1 gal. Chipco Spread Act. ($ 6.70 value)
10 gal. Chipco Buctril	6 lbs. Chipco Thiram 75 ($6.84 value) Or 1 gal. Chipo Turf Herbicide MCPP ($9.85 value) Or 1 gal. Chipco Turf Kleen ($7.52 value)
30 gal. Chipco Turf Herb. MCPP	1 gal. Chipco Buctril ($18.54 value) Or 3 gal. Chipco Turf Herb. D ($13.62 value) Or 15 lbs. Chipco Thiram 75 ($17.10 value)
15 gal. Chipco Turf Kleen	1 gal. Chipco Spread Act. ($6.70 value) Or 1 gal. Chipco Turf Herb. MCPP ($9.85 value) Or 6 lbs. Chipco Thiram 75 ($6.84 value)
10 gal. Chipco Microgreen Liquid	1 gal. Chipco Turf Kleen ($7.52 value) Or 1 gal. Chipco Spread Act. ($6.70 value) Or 1 gal. Chipco Turf Herb. MCPP ($9.85 value)

Chipco Buctril® controls broadleaf weeds in newly planted grasses for sod or seed production.

Chipco Turf Herbicide MCPP controls clover, chickweed, knotweed and other surface creeping weeds and is safe and effective for use on most bent grasses.

Chipco Turf Kleen controls broadleaf and surface creeping weeds with a wider margin of safety around trees and shrubs.

Chipco Spot Kleen is a new systemic fungicide for control of dollar spot, Fusarium blight, large brown patch, copper spot, and stripe smut.

Chipco Thiram 75 prevents and controls large brown patch, dollar spot and snow mold.

Chipco Microgreen Liquid provides long lasting deep green color, more root growth and less desiccation.

Chipco Turf Herbicide D is a general purpose broadleaf herbicide ideally suited where economical control is desired.

Chipco Spreader Activator is a superior adjuvant to increase the efficiency and effectiveness of turf chemicals.

Note: offer expires April 1, 1974.

Chipman Division of Rhodia, Inc., 120 Jersey Avenue, New Brunswick, N.J. 08903

Rhodia
CHIPMAN DIVISION

For More Details Circle (138) on Reply Card

Lifetime membership plaques were presented to 14 members of the Arborists Association of New Jersey. The following have completed 25 years membership with the association which was founded in 1937. They are: (l-r) Harry J. Banker, Harold Kendall, Everett Dyer, Leonard Anderson, Ernest Ricca, Harry L. Birdsall, Howard Voorhees, Walter Whitham, George Henningsen, Andres Knof and Paul Vadnais. Not present are Stanley Knof, Victor Brydon and Charles L. Post.

A deadly disease of elm trees, called elm phloem necrosis, has been found for the first time in New Jersey, according to Dr. Paul V. V. Weber, chief, bureau of plant pathology, New Jersey Department of Agriculture.

The disease has long been prevalent throughout the South and Midwest and in 1971 was discovered in Pennsylvania and New York State. It is caused by a mycoplasm, an organism smaller than a bacteria, but somewhat larger than most viruses. The mycoplasm is believed to be spread from tree to tree by the white-banded elm leafhopper or by root graft transmission when the roots of a diseased and a nearby healthy tree join by natural grafting of the roots.

As the foliage droops, curls and wilts, it takes on a rather uniform yellow color. At this stage, the innermost layer of bark at the base of the tree and in the roots turns the color of butterscotch. If small pieces of this butterscotch-colored bark are placed in a closed jar for a few minutes, an odor of wintergreen can be detected.

There is no cure for infected trees and there are no research-proven control measures.

Tree care is not man's domain, any longer that is. Karyn Blodgett and Carol DeMitry have entered the scene. Both are with Ted Collins Tree and Landscape.

Green Industry Newsmakers

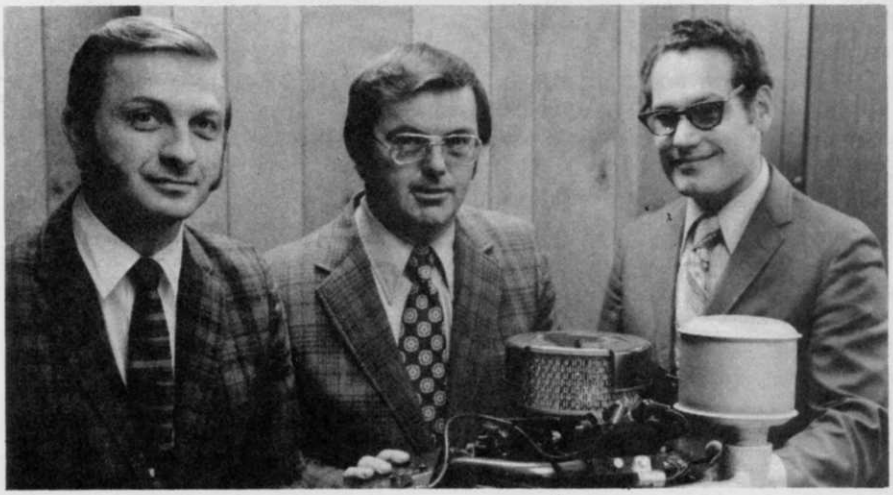
PEOPLE PLACES EVENTS

Rental Equipment Mfg. Co., of Englewood, Colorado, has changed its name to BlueBird International, according to Doug Zehrung, president.

"The name change was a natural result of our gradual increase in business activity in other countries over the past several years," Zehrung said. "And since we're now marketing BlueBird lawn combers in thirteen countries, with the strong probability that we'll be adding still more countries to our marketing area, it was both logical and desirable to make the change. Desirable because most people call us BlueBird anyway, and the shorter name should be easier to remember for the new young people entering our industry."

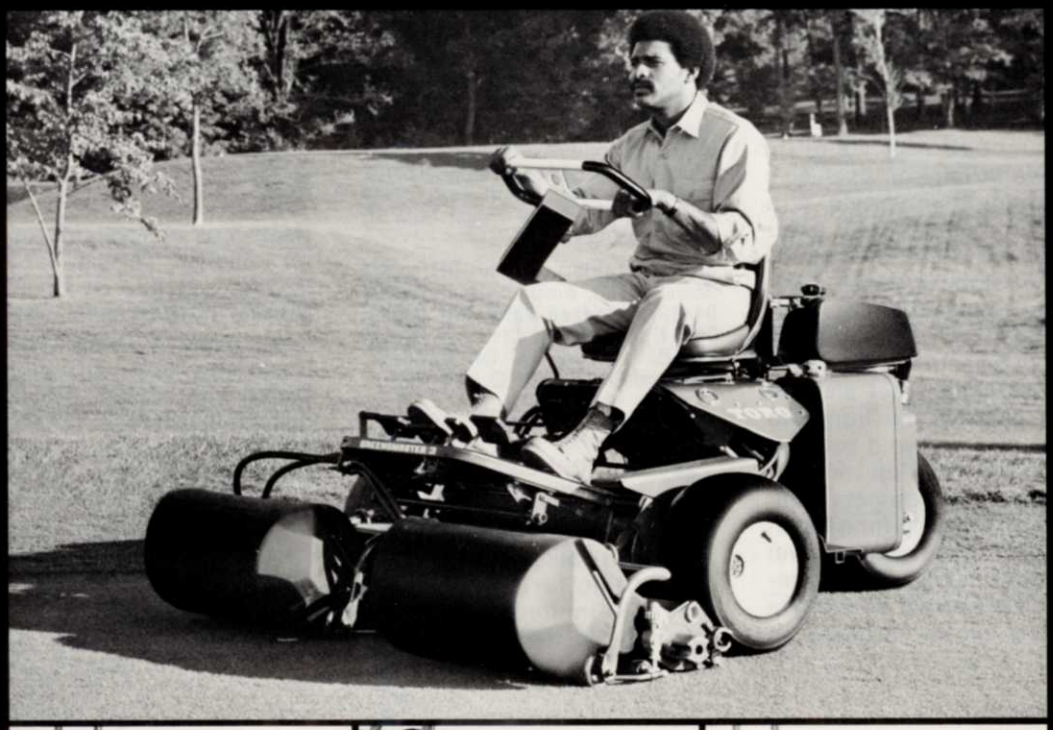
Meet John, Jim and W. J., new officers of the Sprinkler Irrigation Assoc. Officially it's John H. Stevens, president, Jim Pichon, vice president (pres.-elect) and W. J. Ogle, treasurer. Walter Anderson continues as executive secretary.

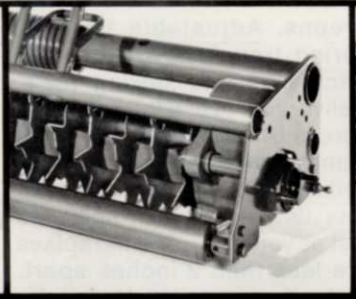
Teacher team or Kohler include Paul Scholten (l), Les Heinemann, and Lowell Johnson (r). They're sponsoring a series of 100 service schools in the U.S. and Canada. Action started last October and continues through April. Topic for discussion: one and two cylinder engines for engine dealers.

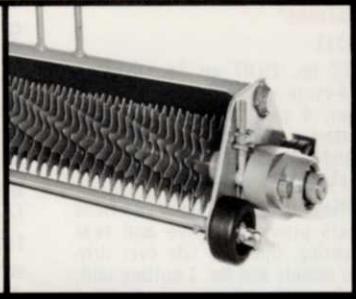


The great Greensmaster 3 still has no equal.

And now it's the best spiker and thatcher, too.







1 AS A GREENSMOWER, the high capacity Greensmaster 3 is the basic machine in the Toro greens-maintenance system. Exclusive features like the balanced, fully floating cutting heads—isolated from the traction unit and the grass baskets—give a uniform cutting height, appearance and playing characteristic to each and every green. Proven history of performance on fine greens all over the world lets you be confident of the real value of Greensmaster 3. (See back of page for complete features, benefits and specs.)

2 AS A SPIKER, the Greensmaster 3 is actually superior to specialty machines. Spiker units replace the three cutting units, penetrate turf up to 1¼ in. deep to relieve surface compaction, deliver water, fertilizer and chemicals quickly to root zones, and slice stolons and/or rhizomes—encouraging the production of new, young shoots. 57″ working width makes spiking practical and efficient for the first time. Toro blade design doesn't ruffle turf. Greens are playable right after spiking.

3 AS A THATCHER, the Greensmaster 3, once again, does a better job than specialty or accessory units. Three thatching units easily replace cutting units. Tempered steel blades are arranged in a spiral pattern to do more work with less power. Variable blade spacing (as close as ½ inch) permits adjustment to meet varying turf conditions. 59″ working width makes vertical mowing practical and efficient for the first time. Result: grain control and elimination of thatch buildup for healthier greens and more consistent playability.

TORO® | GREENSMASTER® 3

TORO® GREENSMASTER® 3

1 AS A GREENSMOWER, the features and benefits include:

Balanced, fully-floating cutting heads — isolated from the traction unit and grass baskets — give uniform cutting height from first green to the last (a Toro exclusive). Low pull point on all cutting units for straight, even tracking. 15-inch turning radius for greater maneuverability, faster handling. Low-noise fully-hydraulic drive is smooth and easy on the greens. Maximum operator visibility and ease of control. Exclusive interchangeable wheels, cutting units, baskets, reel drive motors save time, money invested in stocking parts. Customizing accessories for varying conditions — including a simply engineered and easy to install individual reel shut-off kit that controls the front two cutting units to give a variable track on the clean-up run. Optional reel roller scrapers minimize grass build-up for a beautiful appearance even on wet turf. Proven history of performance on fine greens all over the world lets you be confident of the real value of Greensmaster 3.

SPECIFICATIONS*

Model 04311

Engine: 12 hp, 29.07 cu. in., dynamic balance, 4-cycle with dry paper element air cleaner, 4 pint lubrication system, electric starting with 12 volt lead-acid battery, and 5 gallon fuel capacity. Hour meter is standard equipment.

Configuration: Tricycle vehicle with front two wheels providing drive and rear wheel steering. Operator sits over driving (front) wheels and No. 1 cutting unit, with No. 2 and 3 cutting units in front of vehicle.

Traction Drive: Direct driven hydraulic pump through stack valve to orbital gear motors which directly drive wheels.

Cutting Unit Drive: Belt driven hydraulic triple pump through stack valve to gear motors which directly drive reels.

Speeds: (approx.) (3300 RPM Engine) 1st — 3.7 m.p.h. 2nd — 7.0 m.p.h. Rev. — 3.7 m.p.h. Reels — 1800 RPM.

Clip: .27 approx.

Brakes: Two 6" drum type mechanical with pawl and ratchet lock for parking.

Tires: (3) 18 x 9.50 x 8, 2-ply pneumatic tubeless demountable and interchangeable.

Tire Pressure: 8 psi front; 12 psi rear.

Oil Reservoir: 6 gal. capacity with diagonal baffle to separate suction side from return side.

Wheel Bearings: Drive Wheels: needle bearings provided in wheel motors. Caster wheels: Timken tapered-roller.

Cutting Units: Reel diameter: 5". Height of cut: 3/16" to 1 1/16". (1/8" with thin bed knife.)

Reel Construction: 8 blades riveted to 5 cast spiders. **Power:** Hydraulic motor splined to reel shaft. **Bearings:** Timken tapered-roller. **Bedknife Adjustment:** Opposed screw. **Roller Adjustment:** Front: micrometer hand adjustment with bolted clamp lock (1 turn=.025" H.O.C. change). Rear: pivot-arm quick change with spring actuated tapered-pin lock (.21" H.O.C. change). Slotted plate with locking screw for roller/reel parallelism.

General Specifications: Width of cut: 59". Wheel tread: 49 1/2". Wheel base: 45 1/2". Turning radius: 15" uncut radius. Overall length: 87 1/2". Overall width: 69 3/4". Overall height: 50 1/4". Net weight (with all fluids): 1080 lbs.

Optional Equipment: Full Roller Kit (Model 04412), Wiehle Roller Kit (Model 04413), Swedged Roller Kit (Model 04414), Rear Roller Cleaners (Model 04417), 1/8" Height of Cut Bedknives, Individual Reel Shut-Off (2 reels only).

2 AS A SPIKER, the features and benefits include:

Special Toro profile-tooth spike blade that spikes cleanly without ruffling turf (greens are playable immediately after spiking — no rolling or cutting needed). Power driven reels with one-way slip clutch give added traction on sloping greens. Adjustable transfer spring transfers weight from traction unit to spiking reels. Delivers up to 650 lbs. of weight across 57 inch width for maximum 1 1/4 inch penetration. Wide spiking area gets more done in less time — you can spike as fast as you mow. And the spikes are less than 2 inches apart. A depth measuring tool is included with each set of spiker units to insure effectiveness of treatment under varying conditions.

SPECIFICATIONS*

Model 04420

Unit Working Width: Effective width per unit — 19 inches; overall width of set of 3 units — 57 inches.

Downward Force: Basic unit weighs 84 lbs. per unit (252 lbs. for set of 3). Available override spring transfers weight from basic traction unit to spiker head.

Min. downward force: 84 lbs./unit (8.4 lbs./blade)

Max. downward force: 220 lbs./unit (22.0 lbs./blade)

Performance: Spiker penetration — up to 1 1/4 inch; gauged by supporting rollers.

Number of spike holes — 26 1/2 holes/ft. sq.

Spiker Blades: Blades high carbon steel — .105 inch thick. Special profile design for minimum disturbance of soil surface when spiking.

8 points per blade, 10 blades per unit (30 blades per set), 7 3/4 dia. blade point to point.

Power: Spiker powered by Greensmaster 3 reel drive motors; reel motors drive gear box — 12:1 speed reduction; output speed—150 RPM; gear box contains one-way slip clutch for "free wheeling" in forward direction; powered spiker unit assists basic traction unit when required.

3 AS A THATCHER, the features and benefits include:

Reels cut in forward rotation for efficient vertical mowing. Spiral pattern of thatcher blades means less wear on drive motors, more efficient thatching and throwing of thatch into basket. Adjustable gauge wheels tailor cut to various turf conditions. Variable blade spacing (as close as 1/2 inch — depending on the need) permits adjustment to meet varying turf conditions. Gauge plates are provided for easy bench setting of penetration depth, 59" working width makes vertical mowing practical and efficient for the first time. High strength blades are made of blue-tempered high carbon steel — and they're reversible for double the life.

SPECIFICATIONS*

Model 04416

Reel Diameter: 5".

Unit Working Width: Effective width per unit — 20 inches; overall width of set of 3 units — 59 inches.

Depth of Penetration: Infinitely variable, up to a maximum depth of 1/4".

Reel Construction: Flat hardened steel blades spaced between various combinations of 1/4" spacers. Spacings between blades to vary from 1/2" to 1 1/2". Set at 1/2" spacing at factory.

Power: Hydraulic motor splined to thatcher reel shaft.

Bearings: 1-inch shaft ball bearings retained in cast iron bearing housings.

Reel Adjustment: Pivoting shaft in slotted main frame.

Grass Shield Adjustment: Four bolt mounted shield. Slotted mounting straps for adjustment to reel to regulate throw characteristics.

*Specifications and design subject to change without notice.

Toro is an exclusive trademark of The Toro Company.

LETTERS TO THE EDITOR

BEG YOUR PARDON

This letter concerns my article on Stripe Smut in your November issue of WEEDS TREES AND TURF. When I submit an article for publication to any journal I object to editorial changes which are not cleared. This helps prevent misunderstandings and mistakes like the one in this article. You added trade names which I could have put in myself if I had wanted them. You not only added them without my permission but in one case used the wrong trade name. In case you haven't realized it yet that mistake reflects on my reputation and not yours since the readers aren't aware they were added without my knowledge.

For your own information thiophanate-methyl is sold under the trades names Fungo and Spot Kleen. Cleary's 3336 is thiophanate-ethyl. **J. M. Vargas Jr., assistant professor, department of botany and plant pathology, Michigan State University.**

Editor's Note: You're absolutely right. We did mis-name thiophanate-methyl. As for trade names, it is the policy of this magazine to include trade names at least once in every article concerning environmental protection chemicals. How else will the reader know what the material is. Generally, most readers identify by trade name and then generic, in that order. As professional communicators we must constantly strive to keep the reader informed in language he understands. Thus, we will continue to edit articles to make them readable and understandable to the entire readership.

CONGRATULATIONS

Just a note to let you know that the members of the International Shade Tree Conference appreciate the excellent coverage of the Boston Conference in WEEDS TREES AND TURF.

Your magazine has for years been a loyal reporter of the International Shade Tree conventions. We thank you for it . . . **Brian Fewer, Western Chapter, International Shade Tree Conference.**

WANTS MORE

I am writing to express my compliments on your (inside) back covers of June 1972, September 1972 and August 1973 and would like to see more of these in future issues.

These covers are extracted and put into a separate folder. If you could extend this into different diseases in turf and trees it could make a fine addition to your magazine.

Thanks also to Scotts for their advertising. **George D. White, Superintendent, Main Street Cemetery, Dalton, Mass.**

TIME TO RENEW: Your Renewal Card Is Bound In Above

WEEDS TREES AND TURF is sent to you because you and your business are part of the Green Industry. You receive this magazine on a free basis.

To continue receiving each issue at no cost, we need your okay. Subscriptions are limited to bonafide members of the Green Industry. If you operate commercially within this dynamic marketplace, you qualify.

MAY WE HEAR FROM YOU TODAY? The attached card above is for your use. Please check the type of business you are engaged in, sign the card and drop it in the mail. We'll do the rest. We want your continued support. Thank you, Arthur V. Edwards, Publisher.

(This renewal notice is a requirement of our national auditing service to verify that you are a member of the industry and that you wish to receive the magazine.)

NEW
FROM PURDUE UNIVERSITY

SODCO KENTUCKY BLUEGRASS

U.S. Patent 3135, 3175, 76, 77

Dr. W. H. Daniel, Purdue University, devoted 15 years of breeding, observation and comparison of bluegrass selections before the release of SODCO in 1967. Each of the four lines that make up SODCO were granted patents during 1972. SODCO has exceptional eye appeal due to its firm texture and very dark green color.

SODCO KENTUCKY BLUEGRASS has outstanding disease resistance and has received superior disease ratings in tests from major universities and turf organizations for:

- STRIPE AND FLAG SMUT RESISTANCE
- POWDERY MILDEW RESISTANCE
- LEAFSPOT RESISTANCE
- STEM AND LEAF RUST RESISTANCE

SODCO is a dwarf type variety with low growth profile and slower rate of leaf extension. Shade studies and greenhouse tests have proven SODCO to have **SUPERIOR SHADE TOLERANCE** over other bluegrass varieties.

For information and pricing, write or call:

Agricultural Alumni Seed Improvement Association, Inc.
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SODCO KENTUCKY BLUEGRASS IS PREFERRED BY THOSE WHO KNOW TURF

WTT SPECIAL FEATURE

By RAY LARIVIERE
Formerly Branch Manager
Berkeley Pump Company

Irrigation Pump

START UP MAINTENANCE

A WEEK TO several days prior to actual start up, an operator should remove the spark plugs and add a 50-50 mixture of diesel fuel and 10 weight oil to each engine cylinder and replace the spark plugs. At this time he should also open the seal on the suction of the pump and inject this same mixture between the eye of the impeller and the wear ring and then reseal the suction. When ready for the actual start up, the batteries should be charged and connected, taking care to clean all connecting terminals.

The tape on all engine openings should be removed, and the air cleaner refilled and replaced on the engine.

All electrical connections should be checked for tightness and corrosion and cleaned if necessary.

The spark plugs should be removed and the engine turned over slowly, without starting, to expel the oil in the cylinders. At this time the operator should insure that the pump is turning freely and is free of foreign objects. The spark plugs can then be replaced.

The suction and discharge piping and connections should be checked to be sure they are clear of foreign objects and, using new gaskets and pipe dope, can be reconnected.

The packing gland should be removed and new packing should be installed in the stuffing box as far forward as can be reached. The gland can then be installed, just tight enough to prevent the entrance of air while priming. If the stuffing box is equipped with a grease fitting, a new charge of grease should be applied.

The primer and priming valve should then be reinstalled and the pump primed.

After checking engine oil and coolant levels, the engine should now be started and slowly brought up to warm-up temperature. At this time the operator should check all of his safety switches to insure they are working. The over-temperature switch can be checked by removing a fan belt, water pump belt, or covering the radiator. During these tests the operator should watch the engine gauges very closely so that should any of the safety switches fail to work he can shut the engine down and replace or repair the switch. Since the engine oil must be drained anyway, the operator can check the low oil pressure safety switch by removing the drain plug from the engine while it is running slowly.

The engine should then be refilled with the proper oil and restarted.

To check a loss-of-prime safety switch the connection between the pump and switch can be removed allowing the pressure to drop to the switch.

The operator should then check the engine and pump for any leaks

(continued on page 26)

OPERATIONAL

THE STUFFING BOX area is of primary concern in the operational maintenance on the fluid end of the pumping unit. Most centrifugal pumps used in the irrigation field are of stuffing box construction. By its design, a stuffing box must leak a little of the fluid being pumped in order to cool and to lubricate the area where the packing contacts the shaft or shaft sleeve. If we do not allow proper leakage through the stuffing box the packing will become overheated and dry, resulting in the burning of the packing and the scoring of the shaft sleeve.

Once the packing is burned and hardened and the shaft sleeve scored, no amount of adjustment will maintain proper leakage for any length of time. The shaft or shaft sleeve must then be replaced and a full new set of packing must be installed. Proper leakage varies some among the manufacturers, but generally a leakage of 8 to 10 drops per minute is acceptable.

Although most sprinkler systems today operate at high pressures at the pump, usually in a 60 to 100 PSI range, pump manufacturers have designed most pumps used in this field so that the stuffing box of these pumps are subject to considerably lower pressures than what is felt at the pump discharge, usually only 20 to 30 PSI. This means that when tightening the packing gland of a pump that is producing

TROUBLE SHOOTING

WHEN I THINK of troubleshooting, I think of a story that was told once about a lady who had a domestic pump that had stopped working. The lady called a repairman. The man studied the pump for a couple of seconds and then hit it once with a hammer. The pump immediately started working. Several days later upon receiving a bill for $28.17, the lady called the repair shop and demanded an itemized statement.

She received the statement and it read: Repair of pump: Hitting with hammer—.17, Knowing where to hit —$28.00.

Troubleshooting a centrifugal irrigation pump is much the same as that repair job. Fixing the trouble is usually easy, knowing where to look for the trouble is the big thing. To know where to look for the trouble, a person must understand the function of a centrifugal pump.

The function of a centrifugal pump is to take the water that is delivered to the eye of the impeller and pump this water to another destination. It is **not** the function of a centrifugal pump to pull water from any source. It only pumps water that is delivered to it. Ninety-five percent of all troubles when a centrifugal pump will not perform can be found on the suction side of the pump unit; the failure to deliver water to the pump, or the failure to deliver enough water to the pump.

Let's take a case where a centrifugal is operating under a suction lift condition. The operator has a vacuum type primer on this unit and after operating the priming device for some time is unable to raise the water into the eye of the pump. This trouble is usually caused by air leaking into the pump or suction

And Engine Care

MAINTENANCE

75 PSI at the discharge you are only working against a pressure of approximately 20 PSI at the packing. Therefore, a pump of this type with the sleeve and packing in good condition and properly adjusted should not require constant readjustment, but should be checked daily.

Operators of the pumping equipment should take caution that should additional rings of packing be needed, add only the type and size of packing as recommended by the manufacturer. Different sizes or types of packing, other than recommended, might not give the proper service and might damage the shaft sleeve.

Most operators of pumping units are more familiar with the proper operational maintenance for engines than for pumps; most will check the coolant and oil levels. However, in many cases the operator, when adding to the coolant or oil, fails to add the proper materials. Most manufacturers recommend that their engines be run with a year-round antifreeze type coolant. When running an engine with just water for a coolant, you lose the advantage of the anti-rust type additive that is found in most types of antifreeze. In addition, if only water is used the manufacturers recommend that prior to winter the coolant be drained and refilled with antifreeze for winter storage.

Most engines cannot be complete-

(continued on page 50)

SHUT DOWN MAINTENANCE

THE MAINTENANCE performed on a pump and engine unit at the end of the irrigation season greatly affects the overall life expectancy of the unit. It may well make the difference between being able to get the unit in operation at the beginning of the next season.

Ideally, the pumping unit should be stored inside a protective building during long periods of shutdown. Regardless of whether the unit is stored in a building or left outside, these steps should still be followed prior to storage:

On the pump end, the suction and discharge piping should be removed, all water should be drained from the pump unit and a 50 weight oil should be injected between the eye of the impeller and the wear ring of the pump.

All openings, including the suction and discharge openings should be covered to prevent the entrance of rodents and foreign material into the pump unit.

If the unit has a diaphragm type hand primer on it, the primer should be removed, the opening into the pump plugged and the primer stored in a building.

If the unit has an intake manifold type primer made of glass or plastic, this should also be removed and stored in a building.

If the unit is equipped with a discharge priming valve that has a rubber seat or clack face, the valve should be removed and stored inside or the rubber parts should be coated with a good rubber preservative.

The stuffing box gland should be loosened and if the stuffing box is equipped with a grease cup or a grease zerk a couple of shots of grease should be applied to the stuffing box to force out remaining water and give some measure of protection to the packing.

If the unit is not equipped with grease fittings, the packing gland should be backed off and the last two rings of packing removed and grease packed into the stuffing box. The packing gland can then be tightened slightly to force the grease into the remaining rings of packing; then the gland should be again loosened.

If during the season you had encountered any difficulties with the pumping unit, such as excessive stuffing box leakage, or a serious pressure drop, indicating that your pump was wearing out, now is the time to order the necessary repair parts or remove the pump and get it to your dealer or manufacturer for necessary repairs.

This is the time of year when these people are usually at the low ebb of their season and can get your repairs accomplished. Your unit will be ready to go when you want to start your new season.

If your pump unit is connected to the driver by a flexible coupling

(continued on page 28)

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line as fast as the operator is removing it. A vacuum gauge installed on the pump or suction line will tell an operator if he is actually pulling a vacuum with his primer or just moving air through his pump.

Air leaks can be found in a number of places: holes in the suction hose or pipe, cracks around welds on the suction pipe, loose or poor fitting flanges or gaskets, or cracks or holes in the pump case. If the air leak is not found in one of these areas, the operator should look at the valve on the discharge side of the pump.

Sand or other foreign objects may prevent the valve from sealing properly. The rubber face may be cracked or chipped and not seating properly. Many gatetype valves of all-metal construction will never seal properly to allow a vacuum to be applied to the pump.

The stuffing box on the pump may leak air. This is particularly true of a pump that has been out of service for some time and the packing has dried and hardened. If the pump is equipped with a grease fitting, usually a shot of grease will seal the stuffing box. If the pump is not so equipped, the packing gland might be tightened down to seal. However, the operator should be sure to loosen the packing gland again after he gets the pump going to insure proper leakage.

One other area to look for trouble is in the primer itself. Insure that it is functioning properly. On hand-type primers a check valve insures that air can be pulled out of the pump but not put in the pump. If grass or other foreign objects get into this check valve the operator may be putting air back into the pump at every stroke.

I have seen some trouble getting prime on pumps used as boosters, where a turbine pump is pumping into a centrifugal pump. On this type of installation, where a check valve is used on the discharge side

(continued on next page)

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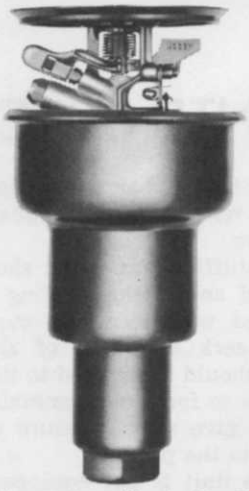

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TROUBLE SHOOTING

(from previous page)

of the centrifugal pump, I have sometimes seen where the check valve had a head of water on the upstream side of it. The turbine pump did not have sufficient pressure to push water through the centrifugal and open the check valve. Since the turbine column contained air, the air fills the centrifugal pump and will not allow the centrifugal to be primed properly to open the check valve. This type of condition is particularly prevalent where more than one turbine and booster combination are pumping into the same line. The first unit will start up because the turbine builds sufficient pressure to open the check valve against a dry line or static pressure, but the second unit cannot open the check valve against the pressure developed by the first unit.

On this type of installation, an air release valve should be installed between the discharge of the centrifugal and the check valve. This will allow the air ahead of the water in the turbine pump to escape and the centrifugal will then get prime and be able to open the check valve.

A pump that primes but will not pump sufficient water or presssure is usually the victim of failure to deliver sufficient water to the pump. All cenrtifugal pumps are designed to operate at a definite design condition of capacity and head at a certain Total Dynamic Suction Head. If the total dynamic suction head for the pump is exceeded, atmospheric pressure may not be able to get as much water to the pump as the pump is attempting to move.

We see this quite often on sprinkler pumps. A sprinkler pump may be designed to produce 900 GPM at 70 PSI for a sprinkler system. This pump, we will say, can be operated at this condition under a total dynamic suction head of 15 ft. We will also say that the suction piping and maximum lift from the water are such that at this condition the total dynamic suction head is 13 ft. The pump will operate satisfactorily under this condition. Many times, however, when this pumping unit is first started on an irrigation cycle the line to the sprinkler system is dry or at least not full and the pump is only pumping against 20 to 30 PSI.

Against this pressure the pump will try to pump 1400 or 1500 GPM; and at a condition of 1400 to 1500 GPM at 30 PSI this pump must be operated at a total dynamic suction head of not over 8 ft. At the same time the increased flow of water in the suction line has increased the friction loss to bring the total dynamic suction head up to 16 ft. Now we have a pump that is trying to pump 1500 GPM, but is only getting 1000 or 1100 GPM delivered to it. The pump will now go into a condition of cavitation and will become very noisy. We have a pump that is a victim of failure to deliver sufficient water.

Fortunately, on most sprinkler systems, this condition may exist for a very few minutes, since, as the line begins to fill, the pressure on the pump increases and the capacity decreases until the system is up to 70 PSI at 900 GPM and the pump is now getting sufficient water. If, however, the level of the water source dropped three feet, since the last time the pump had been operated, our total dynamic suction head would be exceeded and the pump would still not be getting a sufficient supply of water. This could happen when the water source is a pond.

The problem of over-production upon start up of a pump against a dry line can be cured by putting a gate valve or butterfly valve on the pump discharge. The operator keeps the valve closed down during start-up to a point where the pump is always operating against the design pressure until the system is filled. If the water level drops the pump must be moved closer to the water or the suction piping size increased until the unit is operating under the maximum suction lift for which it was designed.

A problem sometimes seen is where a pump is located on the bank of a river or ditch and the discharge line goes immediately down hill from the pump. Under this condition, in trying to start the pump, the discharge head is less than the suction head and the pump will not produce any water at all. After the pump is primed and turned on it merely splashes a little water out. This is a case where the pump is actually losing prime. The discharge head must at all times at least equal the suction head for the pump to work at all. Here again, a valve on the discharge side can be used to increase the discharge head on the pump until the line is full. (Editor's Note: This can happen to spraymen who pull water from ditches or ponds to fill spray tanks.)

At times when a centrifugal pump is being operated as a booster pump this same condition can exist. The

(continued on page 55)

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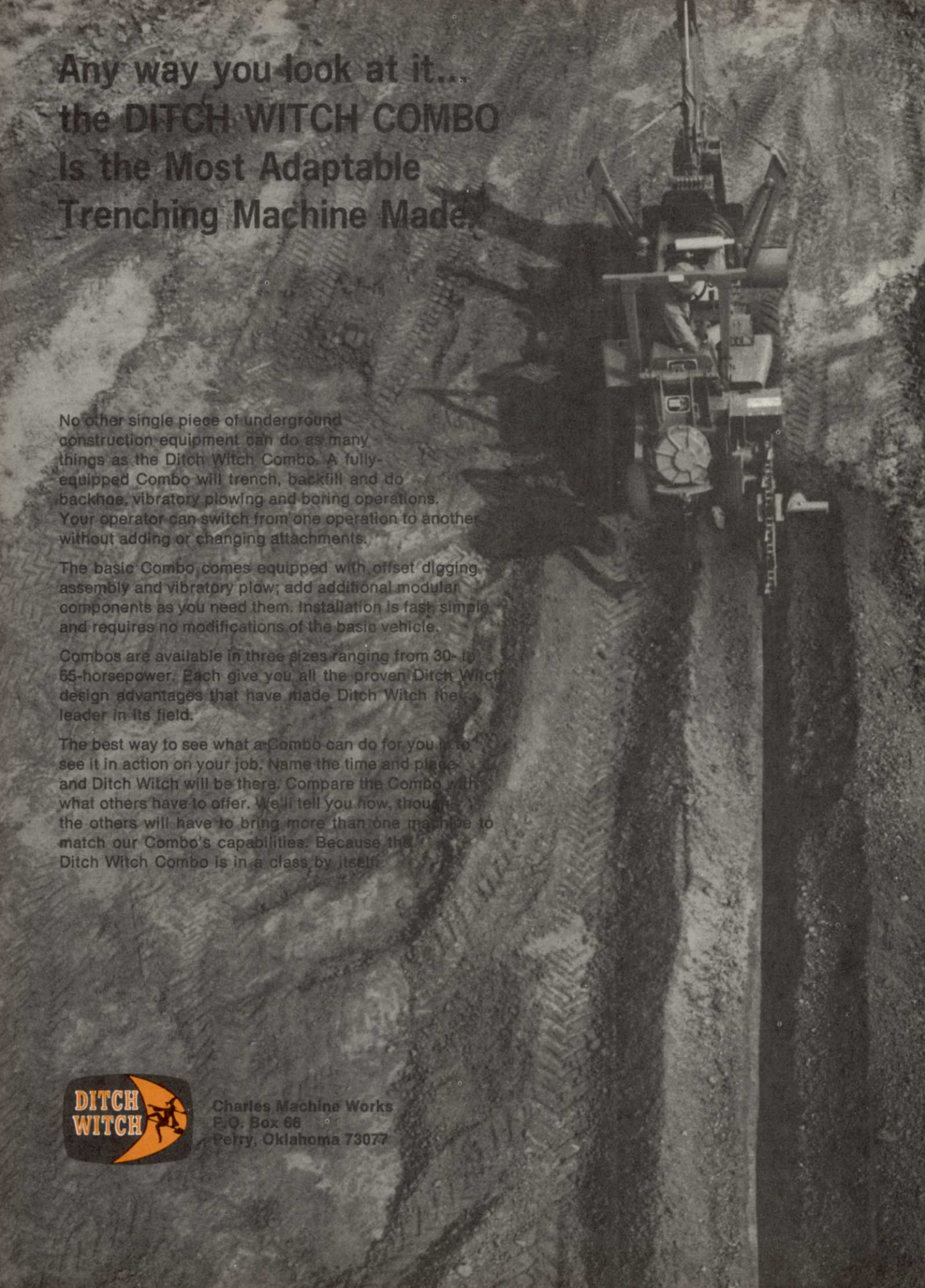

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START UP MAINTENANCE

(from page 22)

caused by drying gaskets and should at this time be able to check and adjust the packing gland on the pump. If the driver is an electric motor, the grease should again be changed, the unit turned by hand to insure that it is free, the motor openings checked for foreign objects or rodents and the area around the air intakes cleaned of weeds or trash.

The switch box should be checked to insure it is clean and free of rodents. The fuses should be replaced after checking to insure that they are not blown.

All electrical connections should be checked to make sure they are tight. A loose electrical connection can cause low voltage and excessive heat causing overload protector tripping and blown fuses. The extremes of temperature during the winter can sometimes cause electrical connections to expand and contract at different rates resulting in a connection that was tight in the fall to be loose in the spring. This is particularly true when aluminum wire is used.

On an electric motor driven unit, the pump end start-up maintenance would be the same as with an engine driven unit; again all safety shutdown switches used on the unit should be checked to insure that they are working properly.

Presented in this manner, pump and engine maintenance seems like a great deal of work, and I have had operators tell me that they do not peform this type of maintenance and yet they get satisfactory life out of their unit. I submit that these people do not know what satisfactory life really is.

Several years ago a farmer in eastern Colorado who used a lot of pumping units, all engine driven, was using one of the major brands of engines, and was happy enough with the sevice they gave him that he kept trading his engines in to the dealer for the same brand when they did wear out. This man was getting 8,000 to 10,000 hours of operation out of each engine and he considered this satisfactory.

The dealer, upon rebuilding several of the engines he had taken in trade from the farmer, found that the engines were not worn out in general, but had excessive wear at several points in the engine, indicating lack of proper maintenance. He requested the farmer to perform proper maintenance on one new engine as recommended to test his theory that most of the failures were due to improper maintenance. The farmer agreed to rigidly perform proper maintenance on this one new engine. As a result the last I heard the engine in question has passed 20,000 hours and was going strong. Now the farmer no longer considers 8,000 to 10,000 hours as satisfactory life and is an advocate of proper maintenance.□

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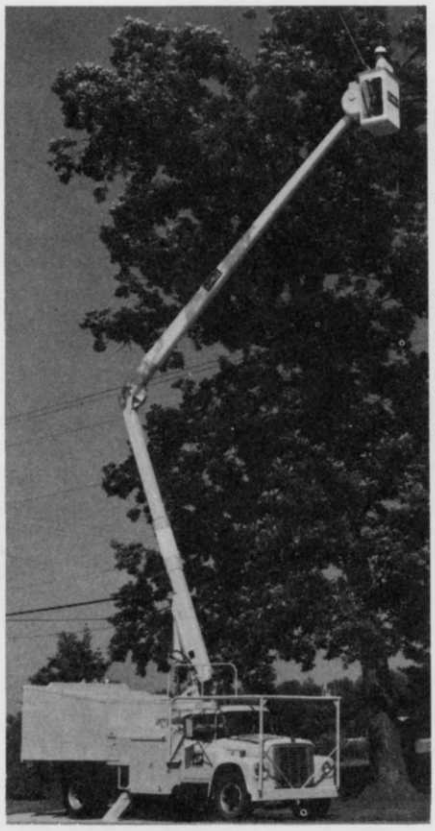

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SHUT DOWN MAINTENANCE

(from page 23)

containing rubber parts, these parts should also receive a coating of preservative. If a flexible shaft is used, grease should be applied at all fittings.

The engine should be run until it is warmed up to operating temperature and then the oil drained and the oil filter changed. New oil with a rust-preventative should be added and the unit again run a short time to distribute the oil. **A word of caution here: if the power unit is connected to the pump through a clutch, the pump should not be allowed to operate during this warm-up period. If the pump is directly connected to the power unit, the warm-up and engine service should be performed prior to draining the pump unit. The pump should not be run without fluid in it.**

While the engine is warm, the coolant should be checked. If you are using one of the all-year type coolants that are now on the market, the level and the degree of protection are all that need to be checked and necessary addition should be made If water or a methanol type of antifreeze have been used, the cooling system should be drained and refilled with water, rust inhibitor and antifreeze.

The spark plugs should be pulled, cleaned and re-gapped and about two ounces of SAE 50 engine oil should be poured into each cylinder and the plugs replaced.

The distributor cap should be removed and a small amount of oil placed on the governor weights and a drop of grease on the grease wick. The distributor cap should then be replaced and sealed with weatherproof masking tape where the cap joins the distributor housing.

The air cleaner and breather cap should be removed and stored inside after cleaning, and all openings in the engine, carburetor, exhaust and breather should be sealed with a weatherproof tape.

The fuel filter should be removed, cleaned and replaced.

Any engine safety switches and the lines to them that are operated by water should be drained completely. Electrically operated safety switches and the ignition system should be given a good coat of one of the spray-on electrical protection compounds to prevent corrosion.

Any grease fittings on the engine should be given a good shot of new grease.

Batteries should be removed, charged and stored in a cool, dry place.

If the driver is an electric motor, the old grease should be flushed out and new grease put in and then the motor run for a few seconds to distribute the new grease and allow the excess grease to get out prior to replacing the grease plugs.

The motor should be protected from oil, water and rodents during the shut down period, **but should not be covered with a plastic or canvas cover that will not allow proper circulation of air in and around the motor during shutdown.**

The starting switch box should be checked for missing knock-out plugs or other holes and these should be sealed against rodents and dirt.

Insure that all switches are in the off position and either lock the panel in the off position or remove the fuses to prevent an accidental or vandal type start-up during the shut down season.

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EDITORIAL

(from page 6)

not what to do for the political process. Green Industry organizations must exercise their lobbying power in government as the organized voice of the membership. Sitting back on the sidelines in silence signifies consent with the situation.

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By ROBERT L. BALFOUR
Vice President
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IF GAS RATIONING becomes a reality gasoline powered golf cars and boats will probably be among the early casualties. This could present a very great and expensive problem for golf courses using gasoline powered golf cars. It is causing such courses to take a long and careful look at electric powered golf cars.

Even if gas rationing does escape the scene, courses using gasoline powered golf cars must think twice about the smoke, noise, odor and pollution problems. There is the distinct possibility that anti-smog devices may have to be installed on all gasolne powered golf cars at costs that could run all the way from $75.00 to $125.00 per golf car.

Light-weight electric golf cars are now being marketed that will provide 36-54 and even 72 golfing holes on a single battery charge, even on the hilliest and most mountainous golf courses.

Thus, it is becoming more and more important that all personnel having anything to do with golf coursess fully understand the golf car battery and its maintenance.

Electric golf cars are now being powered by batteries identified as 75, 88 or 106-minute batteries, instead of the old rating of 180, 195 or 220 ampere-hour batteries. The American Golf Car Manufacturers' Association and Battery Council International have adopted the new rating system.

Generally speaking the 75-minute battery is the equivalent of the old standard 180-amp battery: the 88-minute battery is the equal to a 195-amp battery and the 106-minute battery replaces what was formerly known as a 220-amp battery.

The new rating system will enable golf course personnel to better understand the service they can expect from the batteries being used in their electric golf cars.

A battery is rated by testing with a special battery discharge tester which discharges the battery at a constant rate of 75 amps. It should be done at a temperature of 80° F. This machine records the elapsed time for the voltage to drop to 5.25V per battery, or 31.5 volts for a set of six batteries. This is not a fully discharged or dead condition, but represents a safe level of discharge which will allow the battery to be recharged and put back into service. Therefore, a battery which can be discharged at a constant rate of 75 amps for 88 minutes before the machine senses a voltage drop to 5.25 volts is known as an 88-minute battery.

Each battery contains approximately 400 cycles of life. If a battery is charged after only 50% of its power has been used (specific gravity of 1.200-1.210) only one-half cycle is removed from its life and the batteries should normally perform for two times 400, or 800 battery charges, before they must be replaced.

The golf car that is operated with batteries at or below the 50% reserve may actually achieve another 18 holes of golf, but can do so only by deep-cycling the batteries and removing the energy four to six times faster. A deep-cycled battery will cost the owner two to three full cycles of the 400-cycle batteries' life and result in having to replace batteries after 166 to 200 battery charges.

It is very important that the golf car you buy must not simply have the capacity of going 36 holes of golf on a single charge. It must have the capacity of going 36 holes of golf without deep-cycling the batteries below the critical 1,200 specific gravity level.

A golf course's net profit picture on golf car rentals will improve considerably if they adopt a policy of retiring a golf car to the car shed for charging when the specific gravity reaches the 50% reserve level of 1,200 specific gravity. **Furthermore, it only costs 13.6 cents worth of electricity to charge a set of batteries at the 50% reserve level and it takes 27.1 cents worth of electricity to charge batteries after they have been deep-cycled.**

The owner of golf cars will want to know how much current is being drawn from the batteries in each golf car being evaluated. The golf course having a sizeable golf car fleet would find it will pay excellent dividends to own a good ammeter (an instrument for measuring electric current in volume) as well as a sensitive voltmeter. With these two pieces of equipment, each golf car being considered can be tested for power consumption.

Providing you water, charge and care for your batteries properly, a golfer maintenance man should be able to predict how many rounds of golf the golf car will give each day before having to deep-cycle the batteries; how many months of service one can expect from the batteries; approximately what your electrical costs will be for charging the batteries.

The average golf car being operated with full pedal acceleration will draw an average of 75 amps from the batteries and if the batteries last 88 minutes under these conditions they are considered to be 88-minute batteries.

If a heavy golf car operates with a full pedal amperage draw averaging 150 amps (twice the standard draw of 75 amps), an 88-minute battery becomes only a 44-minute battery and will need to be deep-cycled after 22 minutes of full pedal operation.

If a light golf car operates with a full pedal amperage draw averaging only 38 amps (one-half the test draw of 75 amps), an 88-minute battery becomes a 176-minute battery and will need to be deep-cycled only after 88 minutes of full pedal operation.

Amperage draw against a battery will vary depending on the operating weight of the golf car itself, the

(continued on page PP)

GOLF CARS PRIVATE VS. CLUB OWNERSHIP

By DENVER BROWN
Sales Mgr., Special Vehicle Div.
Otis Elevator Company

GOLF has really come into its own in the past 10 years and that can be attributed to many factors; increased earning power on the part of the average American, more leisure time available to the working golfer, more and more women taking up the game, increased television coverage, bigger purses being offered on the pro circuit, and an increase in the number of golf facilities available to the public.

But perhaps the single most important factor in the growth of golf is the golf car. It also represents, today, the most profitable revenue-producing item for a golf club, whether public or private.

At one time, the golf car was anathema on the course. Who wants those vehicles driving all over, cluttering up the course? And after all, where's the exercise in golf if you use a golf car?

Now, the golf car has come of age. It does not take the exercise out of golf. The exercise is in playing the game, being outside and competing. Most important is the fact that the golf car has speeded up play, vital with the growing numbers of golfers taking to the fairways. And it has opened up more golf to more elderly golfers who were unable to play because of the strain of walking 18 holes.

Grounds maintenance personnel also recognize the benefits of the golf car. With today's turf tires, the golf car does less damage to the course than golf shoes.

Because a golf car fleet is recognized as a necessity, new clubs opening up figure a fleet in the operating budget. However, some older clubs, although a small percentage, still allow member ownership of golf cars. How do they go about converting to a club owned fleet?

Let's take a minute to balance private ownership of cars against club ownership, looking at it from both the individual standpoint and club mangement.

In all cases, I am referring to the electric golf car. Eighty percent of all golf cars in use today are electric and this number will increase as more and more people are becoming conscious of the need, not only to conserve fuel but also to eliminate the noise and pollution caused by gas-consuming vehicles. Also, the figures I quote are for the Otis four-wheel electric golf car although initial purchase prices are about the same, regardless of brand.

Let's say a golfer owns his own car for which he paid $1500.00. For evaluation purposes, we will use five years as an average life span of a golf car with a resale value of $400.00 at the end of five years. During those five years, he'll put out about $45.00 a year for insurance. He will probably also replace the complete set of batteries twice during those five years at a cost of $150.00 each set. Golf cars require tune-ups, just like any other moving vehicle, and the cost for two of those during the five year period will run about $75.00. Service calls for such things as flat tires or blown fuses, etc., are all to be considered.

If his club offers storage and maintenance facilities, he can keep his car at the club for a monthly storage fee of approximately $15.00 and an additional $10.00 per month for preventative maintenance and get-ready charges. This is strictly a matter of convenience and is not mandatory. If he opts to keep it at home, he must count in the cost for a trailer and a slightly increased electric bill for recharging that vehicle at home.

So what is the golf car costing the individual owner? Taking into consideration the maintenance and service costs, replacement of batteries and the initial purchase price, the cost comes to about $3600.00 over the five year period, less the $400.00 resale value.

Now what if that golfer plays at a club or facility which maintains its own golf car fleet? What would be the rental cost to him and how would it balance out against his own membership of the golf car?

If he plays a round of golf a week for 52 weeks at an average car rental rate of $8.00 per round, it would cost him $2,080.00 over a five year period. But he would probably split the cost with a playing partner. And this is all. He would not have the hassle of maintaining his own car, of providing storage and of worrying about winter storage in areas with seasonal play, nor would he be faced with the expense of replacing an outdated or worn out car.

From the club's point of view, what is more important is that the rental income represents practically clear profit to the club and just as important, to the members of that club, decreases the amount of yearly assessments. In short, an individual cannot justify ownership unless he plays more than three times per week, year round.

One golf car alone, acquired by the club (and we will discuss the methods of acquisition later) for $1,500.00 and rented out five times a week for 52 weeks at a rental rate of $8.00 (national average), would bring in $2,080.00 for the first year. And that's based on only one rental per day. On weekends that car will be rented out twice a day on the average — depending on play.

As you can see, that car has brought in a profit in the first year of operation. The second year, the profit picture is even better when the initial purchase is no longer a factor.

Granted there are services and maintenance costs, replacement of batteries, etc., just as with private ownership of golf cars. Even taking that into consideration, the profit picture is still impressive.

And remember, too, that the electric golf car is a simple machine to maintain. Take Otis' golf car. It comes with its own built-in charger and plugs into any 110 volt outlet. No auxiliary power equipment is needed. It has a cycolac body with a welded tubular steel frame. It is weather resistant and its high-impact, rugged cycolac body is rust

(continued on page PP)

Illustrated: New 12 hp Turf-Truckster with optional automotive steering.

10 years running. Turf-Trucksters keep proving themselves.

That 10-year-old Turf-Truckster in the back is still working as hard as the brand new model in the foreground. They were built to last then...they're built even better today.

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For example, the current 18 hp Turf-Truckster works harder than ever. Providing dependable transport for men, material and machines. But now, with optional hydraulic system and PTO, it powers a whole system of modular accessories that aerate, top dress, spray and dump hydraulically. It's an efficient, time saving system that can cut your initial equipment and labor costs dramatically.

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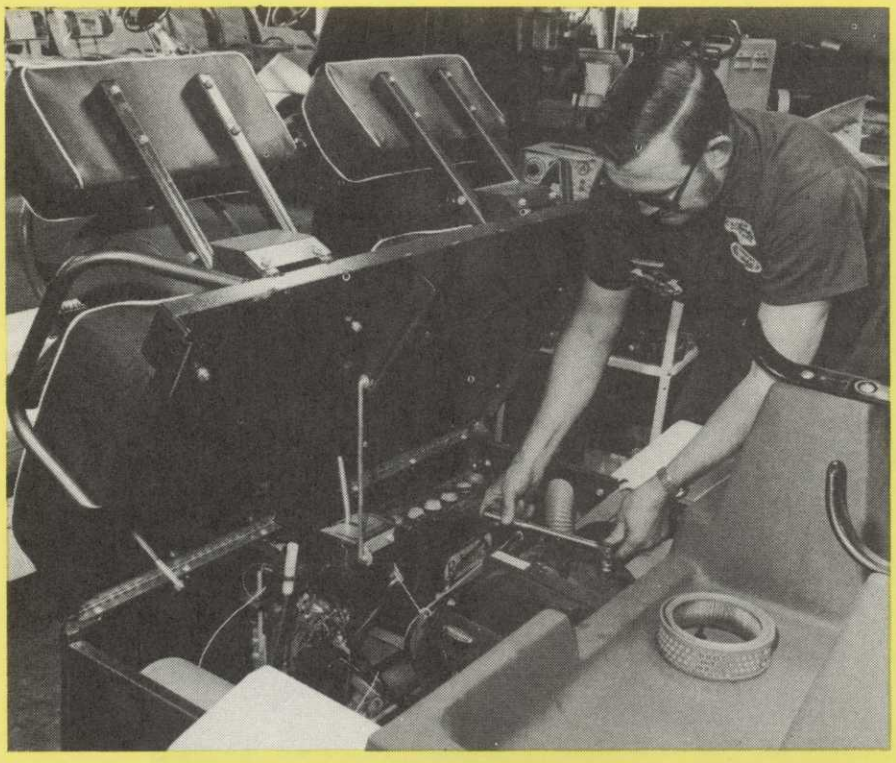
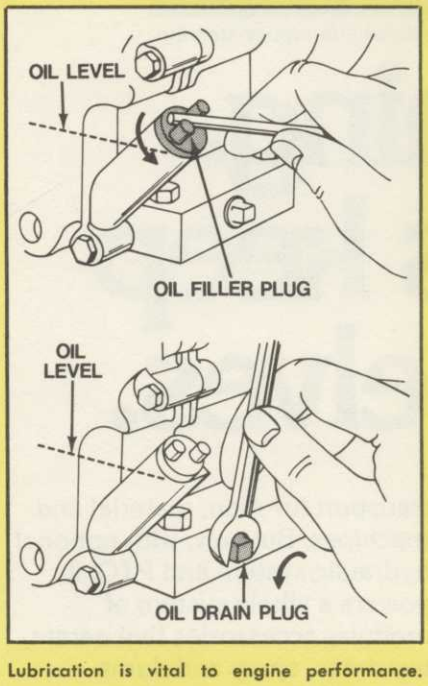
Nine Points

By DANIEL L. HEDGLIN
Cushman Service Manager



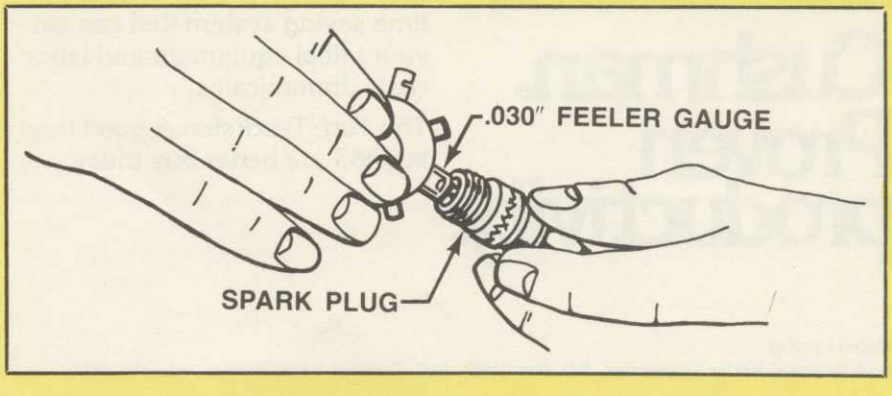
Small engine maintenance is not difficult. It does require regular checks on vital parts. Here workman checks engine and replaces air cleaner.



Lubrication is vital to engine performance.

Check engine markings for specifics.

Gap on spark plug should be checked regularly.



WANT TO GIVE your golf cars or gasoline-powered utility vehicles nine lives? Here's how!

Golf course superintendents and their crews often can prevent serious problems that require expensive overhauls if they follow daily, routine maintenance pointers. So, by adhering to the following nine simple step-by-step small gasoline engine maintenance pointers, you can add years and miles of dependable service to golf cars and utility vehicles.

Keep Air Cleaners Clean: Cleanliness is essential to air-cooled engines on golf cars since the engines operate close to the ground and at low speeds. Thus the engines are vulnerable to dirt. It wears out more engines than do long hours of operation. Even a small amount of dirt will wear out a set of piston rings in a few hours.

Check the air cleaner daily, especially if the vehicle is being used under extremely dusty conditions. Dry air cleaner elements should be cleaned by removing them and tapping them lightly on a flat surface to remove dirt. After cleaning in this manner, if it is not possible to see light through the element, it has served its useful life and should be replaced.

Check or Change Oil: Small engines have small crankcases, so the oil level should be checked daily. The oil should be changed at intervals recommended by the engine manufacturer. Change the oil while the engine is warm. This will allow the oil to flow more freely and carry away more contamination. Refill the crankcase to the proper level with a good grade of oil of the recommended viscosity or weight.

Spark Plugs: Worn, dirty or improperly adjusted spark plugs can cause hard starting and faulty operation. Spark plugs should be changed every 100 hours of operation. Before removing the spark plugs, blow or clean the area around the spark plug to avoid the possibility of dirt or sand getting into the engine. Since it is generally not economical to clean spark plugs, they should be relpaced with new ones. Be sure to check the gap of the electrodes on the new spark

For Smooth Running Engines

plug, since it is unlikely that it will be properly set for your engine. Gap the plug to the engine manufacturer's specifications.

Start the plug in with your fingers to avoid cross-threading. Use a wrench only after you know it is started properly. Tighten the plug tight but don't over-tighten. A torque wrench will assure the proper setting.

Points: Inspect the breaker points every 500 hours or yearly and replace them if necessary. Points that are pitted or burned should be replaced.

Care should be exercised when handling a new set of points. Clean the new set of points with a piece of lint-free paper and then avoid touching the contacts with your fingers. The oil from your hands can cause a new set of contacts to start burning and fail prematurely.

Install the new set of points and carefully adjust the gap to the manufacturer's recommended setting. Remember that in many engines the correct point setting will also assure proper timing. On engines having variable timing, it will be necessary to adjust the timing with the aid of an automotive timing light.

Condenser: The condenser is an inexpensive part, but is just as important to the ignition system as the points. Therefore, it only makes good sense to replace the condenser every time the points are replaced.

Clean Combustion Chamber: Automotive fuels, constant speed and load operation gradually result in build-up of tetraethyl lead deposits in the combustion chamber of golf cars and gasoline-powered utility vehicles. Manufacturers usually suggest that the combustion chamber be cleaned every 100 to 300 hours of operation to remove these lead deposits.

To clean the chamber, remove the cylinder head and scrape or wire-brush the lead and carbon deposits from the head, around the valves and from the piston top. Then reassemble the cylinder head, using a new gasket. When tightening the cylinder head screws, be sure to tighten them in an alternate sequence. For best results, tighten them with a torque wrench to the manufacturer's specifications.

Cleaning Exhaust Ports: Two-cycle engines will get a build-up of carbon in the exhaust system. These carbon build-ups are just as detrimental in the exhaust port as they are in the cylinder head. If these ports are left to build up with carbon, hard starting and a loss of power will be the result. To clean the exhaust ports, remove the muffler and/or exhaust pipe and clean the ports with a wooden dowel.

Carburetor Adjustments: Lack of engine power and black sooty exhaust smoke indicate the fuel mixture is too rich. An over-rich mixture can be caused by either a clogged air cleaner or a carburetor needing adjustment. So, always check the air cleaner before adjusting the carburetor.

Main fuel adjustment—First, turn the "main fuel" screw clockwise until it bottoms lightly **(don't force it)**, then back out two turns. With the engine thoroughly warmed up and running at full throttle and full load, turn the "main fuel" screw in until the engine slows down (lean setting). Then turn the screw out until the engine regains speed and then starts to slow down (over-rich

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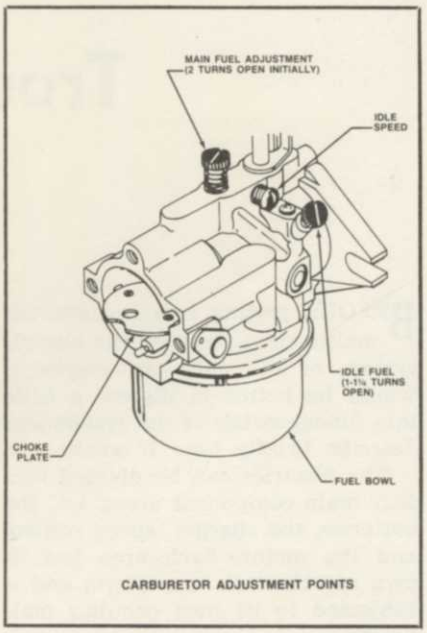
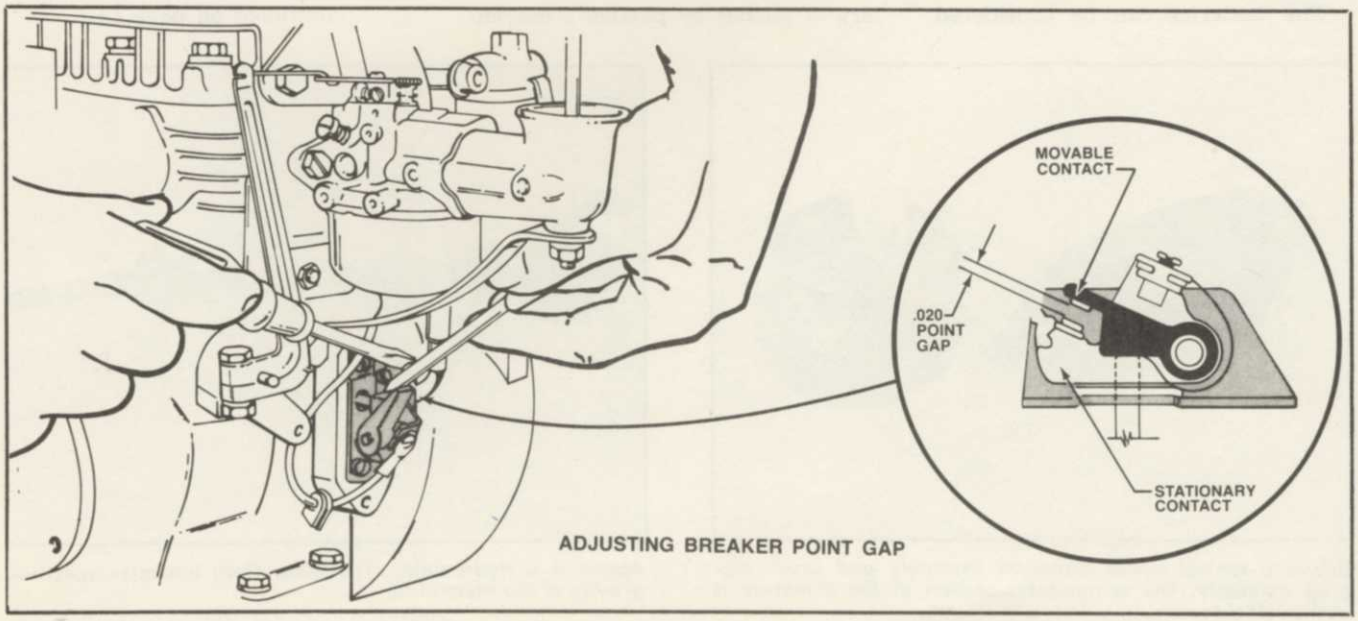
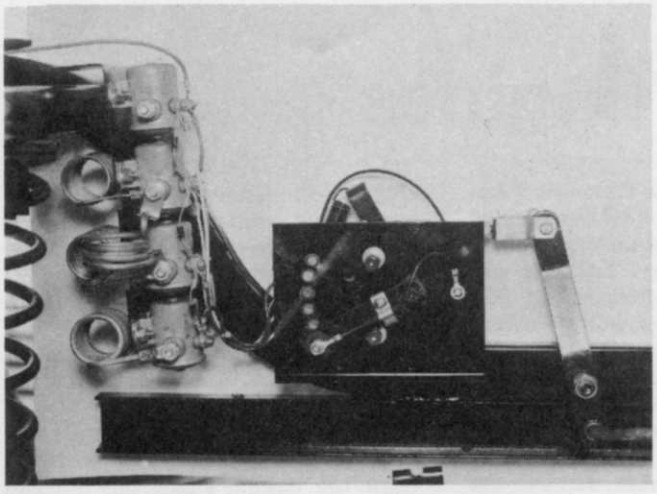


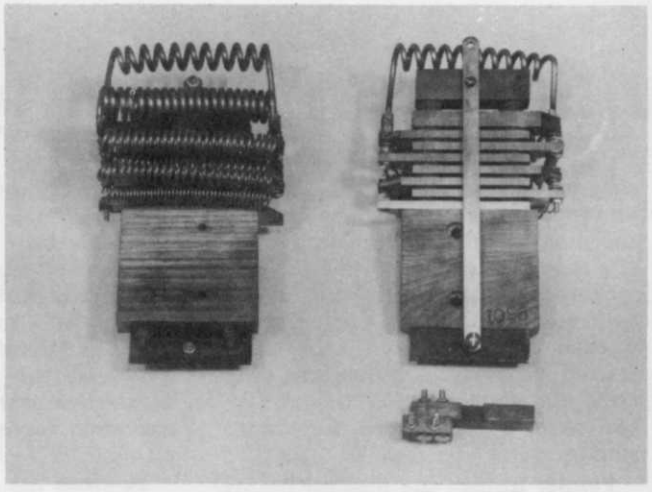
CARBURETOR ADJUSTMENT POINTS



ADJUSTING BREAKER POINT GAP



Version of a solenoid speed control arrangement. Contacts on face plate activate the solenoid holding coils as the foot pedal is depressed.



Typical sliding bar speed control. Resistor coils mounted on the back side of switch are at the left. At right stationary bass is shown. Item in lower right is the brush on sliding bar.

Golf Car Trouble-Shooting

By CHARLES W. POOLE
Engineering Manager
Electric Vehicle Div.
Westinghouse Electric Corp.

BEFORE getting into a diagnostic malfunction study of the electric system of the golf car, maybe it would be better to digress a little into fundamentals of the system and describe briefly how it works.

The electrics can be divided into four main component areas, i.e., the batteries, the charger, speed control and the motor. Each area has its own specific task to perform and is subjected to its own peculiar malfunctions.

The batteries can be considered as the fuel tank of the vehicle and as such they have to be initially filled up with energy before the vehicle can be made to perform. And in the process of performing, obviously, they become empty again. In the case of electric storage batteries the re-energizing is accomplished by passing an electric direct current through the batteries. Actually in one end and out the other. This may sound strange, but the electricity is not stored in the battery at all but by passing a current through the battery, internal changes take place which enable electricity to flow from the battery at a later time.

What happens when an external electrical source is applied to the battery is a chemical action between the negative and positive place in each battery cell This action is aided and in fact couldn't take place without the presence of the electrolite, which is a solution of water and sulfuric acid. Later, when an electrical demand is placed on the battery, this chemical action reverses itself and causes electrons or electricity as we know **it** to flow from the battery.

It is the condition of the electrolite which indicates the state of this chemical action and hence the state of charge of the battery.

The tool used to test the electrolite is called a hydrometer and no electric vehicle repair or mainte-

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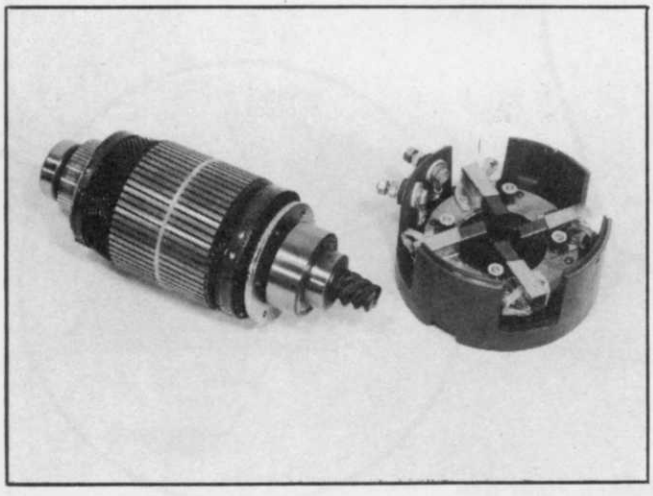
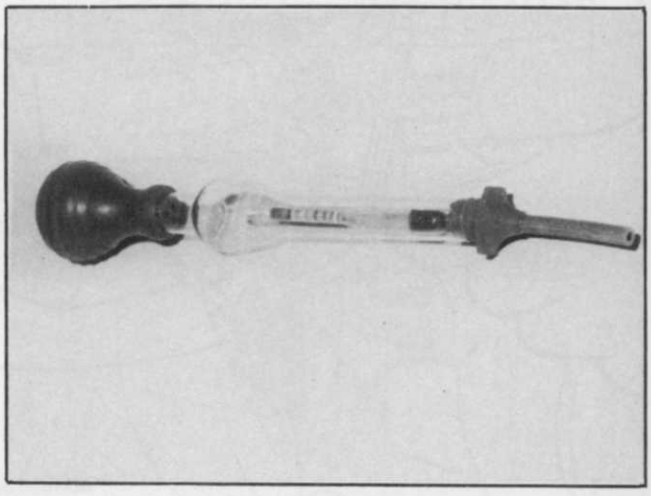


This is a typical motor armature assembly and brush rigging assembly. The commutator section of the armature is at the left side.



Above is a Hydrometer. The inner float indicates specified gravity of the electrolite.

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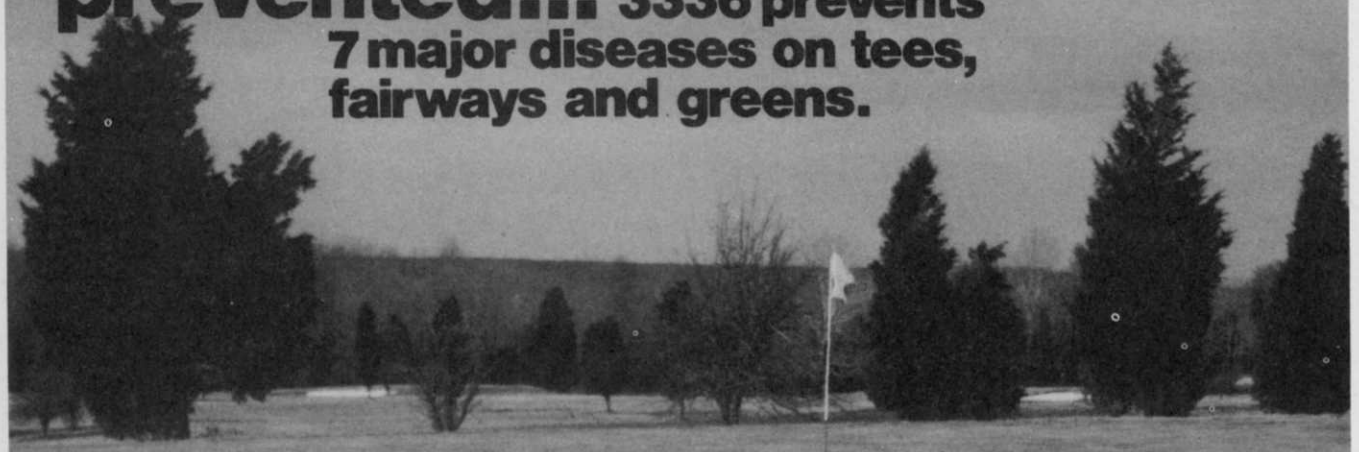

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GOLF CAR TROUBLE-SHOOTING

(from page HH)

nance shop should be without one. The hydrometer measures the specific gravity (sp. gr.) of the electrolite which is approximately 1.26 when the batteries are charged or the complete chemical charging action has taken place. When the batteries are completely discharged or a complete chemical reversal has occurred, the sp. gr. is about 1.18.

Don't let the term specific gravity throw you, it simply means "times the weight of water." Hence, an electrolite with a 1.26 sp. gr. is 1.26 times heavier than water. Therefore, the lower the sp. gr. number the closer the electrolite is to water, and the battery less able to perform.

It would be very convenient if we could simply plug or connect the batteries to the nearest electrical wall socket receptacle for some period of time in order to recharge the batteries. Unfortunately, this cannot be done for two very good reasons.

First, the electricity delivered by the utility companies is of the type called alternating current which would not create the required internal chemical action of the battery.

Secondly, the supply current is usually at a potential of 110 volts. Most golf car electric systems run on a 36 volt battery pack and the recharging voltage should only be slightly higher to avoid battery damage.

This then dictates the need for a charging system which in essence does two things; steps the supplied voltage down to a more acceptable level and changes the alternating current to a direct current. Another necessary feature is a timer switch which shuts off the charging operation after a predetermined time period.

The next aspect of the electrical system is the speed control device. As the name implies, this enables the operator to manipulate the vehicle at various speeds as desired. The type of speed control most often encountered in golf cars is of the stepped resistor method.

The resistors, usually four, are connected in series into the battery power supply circuit and are bypassed individually by advancing the speed control foot pedal.

The by-passing can be accomplished by a copper sliding bar arrangement or by other more sophisticated methods. Usually solenoid contractor units.

The function of the resistors is to create a voltage loss in the supply line from the batteries to the motor. Therefore, as each resistor is bypassed, the voltage to the motor increases until all resistors are bypassed and the motor is receiving full battery voltage and so can perform at maximum power.

Finally, the motor which converts the electrical power into useful, mechanical work is again usually of the series-wound traction type. This means that the coil windings on the rotating armature shaft are connected in series in the battery power circuit with the coil windings of the stationary motor field.

This is achieved by means of the stationary carbon brushes and the rotating commutator section of the armature shaft, which enables current to pass through the rotating armature coils.

One other necessary requirement is the ability to reverse the rotational direction of the motor. This is done by changing the polarity of either the motor armature coils or the field coils. To accomplish this a heavy-duty contact manual switch is employed.

That then briefly outlines the basics of the system, so if a cry for help is received from an irate golfer on the 5th tee whose car has pooped out, what do we do.

In trouble shooting malfunctions in any piece of equipment, always start with the simplest possibilities. In this case, if the car will not run, assume that the electrical energy from the batteries is not reaching the motor. This then could mean:

1. A loose terminal connection in the power circuit at any one of the connecting points, i.e., the batteries, motor, speed control, or the forward reverse switch.
2. A broken power cable, unlikely, but possible.
3. Poor or no electrical contact in the forward/reverse switch.
4. Poor or no electrical contact in the speed control system or a broken resistor coil.
5. Poor or no electrical contact between motor brushes and the commutator.

Looking for loose or broken leads in the field should not be difficult to do or fix on the spot. Checking the forward/reverse switch for good continuity maybe possible in the field, depending on the construction of the switch. Similarly with the speed control. If it is a simple, sliding-bar type then a visible inspection should tell if it is making good or bad contact. If a solenoid switch is employed, place the forward/reverse switch in neutral, then manipulate the foot pedal. All solenoids should close with definite clicks if working properly. If not, the problem could be in the activating circuit or the solenoid contacts. This then would lead to more difficult and complicated trouble shooting and would require repair shop work.

Checklist For Golf Car Trouble Shooting

Problem	Check Points				
Car will not run	Check battery for charge	Check for loose or broken leads & connections	Check forward/ reverse for good connections	Check speed control for good contact	Check motor brushes for good contact
Car runs slow	Check battery for charge	Check brakes & mechanicals	Check speed control	Check motor brushes	
Car runs slowly then stops	Check battery for charge	Check speed control	Check motor brushes		
Car takes off suddenly	Check speed control				
Battery not accepting charge		Check charger fuse, leads and connections	Check AC supply for voltage		Suspect sulfated battery; Replace

♦ For More Details On Preceding Page Circle (135) On Reply Card

If contacts, sliding bars, connections and wires all seem to be correct, then the motor should be checked. The brush cover should be removed and the brushes then inspected for positive pressure against the commutator and free movement in the brush holder. To do this, pull on the brush pigtail then release the brush. The brush should snap back positively against the commutator.

For a car with fully charged batteries but will not run, the cause has to be due to an incomplete electrical connection in one of the areas described above. Depending on the nature of the failure will dictate whether the car will have to be returned for more extensive analysis and repair.

Another type of malfunction is the "sudden take off" of the car. This is almost always experienced in solenoid systems and indicates that either one solenoid is permanantly closed or more than one solenoid is closing at a time when the foot pedal is pressed. Listening to the clicks of the solenoids will give a definite clue to the offending solenoid, or solenoids, in this instance. If diodes are used in the solenoid activating circuit, then they should also be suspect.

A car that runs slowly could also be experiencing malfunctions in the speed control system. This could be caused by solenoids not pulling in when required. Again, check out the solenoids as described above. Also, check the motor brushes for wear and contact with the commutator. Worn down or broken brushes should be replaced. In addition, check the commutator for appearance. It should be fairly clean and only faintly scarred by brush wear. Badly marked and scarred commutator should be cleaned.

Last, but by all means not least, is the charge condition of the batteries. Battery failure is by far the most common cause of vehicles not performing properly.

This type of problem opens up a whole Pandora's box of complexities since it includes as well as the batteries, the charging systems, the maintenance aspect of the vehicle and the way the vehicles are used.

Good care of the batteries is essential if maximum performance and life is to be realized. This comprises of making sure that batteries are fully charged before sending the cars out for 36 holes of play. This avoids deep discharge cycling of the batteries which is detrimental to the battery. Also maintain an adequate level of distilled water in the batteries. The cell plates should never be exposed to the atmosphere. This causes oxidation and renders the area exposed as useless. The vehicle should be in good mechanical order, check particularly tire inflation pressure, wheel bearings and brake adjustment. This is to eliminate unnecessary rolling friction from the vehicle and, thereby, reduce the electrical load on the battery.

Finally, poor battery performance could be attributed to inadequate or failed charging systems. This can easily be ascertained by checking the batteries with a hydrometer after recharging the batteries for the recommended time period. If a recharging problem is experienced, rotate the charger to other cars. If the problem still persists, then the chances are the charger is at fault. If the problem only persists with one particular car then the batteries are suspect, possible sulfated and will not recharge.

The above thus describes broadly the functions and generalities of golf car electrical problems most commonly encountered.□

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Positives And Negatives Of Battery Care

By ARVID HALLA
Sales Manager, GBC Brands Div.
General Battery Corporation

GOLF CARS, turf vehicles, maintenance equipment can be operated on noiseless, low-polluting battery power efficiently and economically if the power source is purchased and maintained properly.

There is never any excuse for a battery-powered vehicle breaking down because of battery failure. Few caddy masters would send a gas-powered golf car out without a full tank of fuel; yet, there are some who, for some reason or other, permit the fuel supplies in these individual vehicles to run low.

The same parallel may be drawn for the battery-powered vehicles. On one hand, there are many who swear by the battery-powered golf car while many others swear at them. Who's to blame? The battery maker? The pro? The caddymaster? The maintenance crew?

In truth, probably all of us are partially to blame because we have not effectively communicated the simple maintenance steps through to the people who have the responsibility to keep up battery charges and electrolyte level. Perhaps, the wrong capacity battery is installed and incapable of meeting the specific course terrain.

SELECTING THE RIGHT BATTERY

Let's start off with choosing the right battery that is compatible with the course.

Generally, there are two sizes of electric vehicle batteries available. However, General Battery Corp. will soon offer three sizes. Individual battery construction varies the same as in batteries used in the automotive industry. In effect, you get what you pay for and, you may not need the top of the line battery to meet your course demands. Although then, again, you may, depending upon terrain, length of season, age of cars, etc.

For instance, our high performance battery offers direct point-to-point energy to offer maximum power and extra life and a 107-minute rating. Although this is the biggest, it offers the lowest cost per round because it is engineered for more payload and greater distance.

Our medium range battery offers 90 minutes of performance reliability. Both batteries with polypropylene container and cover are available wit heither the wing-nut or nut and bolt connector. GBC is currently experiencing a demand for a "Super" electric vehicle (E.V.) battery with even more performance than the top of the line. It will be introduced soon. This is an indication of more sophistication and knowledge on the part of the E. V. buyer.

The batteries are all tested in accordance with standards established by the American Golf Car Manufacturers' Association. Carefully analyse your course requirements to make the proper selection.

NEW BATTERY CARE

Incoming shipments of batteries should always be inspected for damage incurred in shipping. Look for any damage to the battery cases — wet spots on the carton may indicate a cracked or broken battery. If any breaks are found, get acknowledgement from the shipper and file a claim against the transportation company — and be sure to contact your supplier for replacement batteries.

Batteries are normally shipped in a wet charge state. If you receive wet charge batteries that are not immediately put into service, they must be charged at regular intervals as follows:

Storage temperature	Charge
Below 40°F.	None needed
40°F. to 60°F.	Every two months
60°F. and above	Every month

Storage—Never stack one battery atop another. If they must be stored, place supporting boards between layers and **never** stack more than three high. Be sure to rotate stock to use the oldest batteries received first.

Installation — Follow the vehicle manufacturer's instructions. Connections should be tight to assure good contact and always charge sets of batteries immediately after installation.

MAINTENANCE: KEY TO LONG LIFE

The biggest mistake that can be made in operating a fleet of battery-powered vehicles is to neglect proper maintenance. Maintenance, too frequently is simply thought of as "adding water and a charge", and the job is handed to the low man on the totem pole.

No problems will be encountered, even using the "low man", if certain basic steps are outlined — and frequently checked by the individual responsible for fleet maintenance.

Water batteries at least once each week — preferably on a fixed schedule. Water with high mineral content can shorten battery life. Therefore, certain areas may require distilled water. Check with your battery supplier if in doubt.

Before charging, be sure that the electrolyte level is above the top of the plates (but do not overfill).

After charging, fill all cells to their proper level. Do not overfill and do not take a shortcut often seen on golf courses by using a high pressure watering hose. This method floods the cells, dilutes the electrolyte and affects performance. Check periodically, in between charges, to make sure that water level doesn't drop drastically.

If a battery seems to be using excessive water, check for one of the

(continued on page RR)

The laugher.

Here's the 9-gang giant that will take on the biggest mowing event you can come up with and turn it into a laugher.

Grady Hassell can tell you about it. He's with Lawn & Turf, Inc. in Conyers, Georgia.

As a Jacobsen Distributor he has all the answers about Jacobsen equipment. Like the huge F20 9-gang mower.

He'll tell you that it cuts a wide 19-foot swath. It has a gargantuan appetite that can cut through 76 acres in one work day. And that's mowing at a realistic pace.

But it's easily tamed for more delicate chores because the operator can raise and lower any of the reels with a finger-tip control. Things like median strips can be mowed from the road shoulder with the outboard reels, for example.

Just because it's big doesn't mean it's clumsy. Far from it.

There's a ground-gripping front drive that gives sure traction on grades and sidehills.

And the rear wheel steering means that the reels turn in the same arc as the steering wheels. No skidding, no skipping, no uneven cutting in the turns. And no wheel streaks in the straightaways, either.

If you have big mowing chores ahead of you, ask your Jacobsen Distributor about how the mighty F20 can help you. An actual demonstration should put a happy smile on your face.

What it does with your turf will make you chuckle.

Your Jacobsen Distributors.

Before we sell it, we buy it.

For the name of the distributor near you write: Jacobsen Turf Distributor Directory, 1721 Packard Avenue, Racine, Wisconsin 53403.

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GOLF CAR BATTERIES
(from page CC)

weight of the passengers, the degree of the slopes or hills on the golf course, the efficiency of the transmission, the temperature conditions under which the golf car is operated and the horse power of the motor.

If the average battery has a cost of $25 and each golf car contains six batteries ($150 worth of batteries) it obviously can make a great deal of difference in a course's net profit from golf car rentals if one obtains 800 battery charges as against only 200 battery charges and, at the same time, cuts his electricity costs for charging batteries in half.

DON'T BE CHEATED ON BATTERIES

It has been reported in several areas that golf course executives are unknowingly evaluating electric golf cars containing six of the more expensive 106-minute (220-amp) batteries and then getting only 75-minute (180-amp) batteries in the golf cars when they are delivered. This is being done by some golf car salesmen to circumvent the lighter weight of other golf cars and make it appear on testing that their golf car can obtain the necessary distance (minimum of two rounds) between battery charges without deep-cycling the batteries.

Unfortunately, the amperage or rating in minutes is not identified on many batteries. Some of the 88-minute and higher priced 106-minute batteries are packaged in a casing of exactly the same dimensions. **The only sure way to tell the difference is to weigh the batteries.** Both batteries contain 19 plates per cell (57 plates), but the 88-minute battery weighs 598 pounds and the 106-minute battery weighs 65.1 pounds.

Make certain you ask all golf car salesmen to identify what amperage batteries are in the demonstrator golf cars you are evaluating and what amperage their golf car pulls on a level grass surface with an average 360 pounds of passenger weight. Then ask for a guarantee that the test golf car contains the same amperage batteries you expect to pay for and receive when your golf cars are delivered.

If you wanted to buy a boat having a 20 h.p. motor, it wouldn't be fair if one salesman demonstrated his boat equipped with the 20 h.p. motor, but another salesman demonstrated with a more expensive 50 h.p. motor.

Insist on demonstrator golf cars being equipped in exactly the same way you expect to buy and pay for them.□

PRIVATE vs. CLUB CARS
(from page DD)

proof, corrosion proof and never needs painting.

Many clubs with large golf car fleets hire a maintenance man for about $6,000.00 to $7,000.00 per year who maintains that fleet in good working order, paying off in the long run. A golf car that is not out on the course is not producing revenue.

Since the profitability of owning a golf car fleet is evident, how do you go about establishing a fleet, especially if your club now allows individual ownership of golf cars.

If your members now have their own cars, you can purchase the cars from them outright, rent them back to them or use the cars as trade-ins on a new fleet.

Or you can acquire a new fleet outright, and let the individual car owners dispose of their own cars.

And just how does a club acquire a new fleet without a tremendous outlay of capital, capital most clubs just don't have?

It is recommended that a course have one golf car for every eight golfing members. If your membership is 400, that means 50 golf cars at a purchase price of approximately $75,000.00.

Don't let that figure throw you. There are many ways to acquire that fleet without huge assessments to members and without using capital earmarked for other more critical uses, such as course repairs, new facilities, etc.

For instance, Otis and other golf car companies have worked out multiple ways in which you can acquire cars without capital outlay.

One is a lease program with a purchase option whereby you have a set monthly payment of approximately $45.00 per car. Compare this investment with the income of $8.00 per round, five rounds per week or $40.00 times 4⅓ weeks and you have a gross profit for the month of $130.00. This multiplied by 12, then multiplied by the total number of cars in your fleet comes to a real tidy profit for your club.

"Give me the manager's office!"

Now, this lease program also gives you the right to purchase these cars at any time during the lease. However, why purchase? Upgrade your fleet by phasing out old cars and bringing in new ones on the lease program without increasing your monthly expenses. Two important reasons for upgrading a fleet: 1, you keep your members happy, and 2, you keep your maintenance costs low.

The second plan, becoming more popular with many customers, is the rental participation agreement. A club's responsibility for maintenance is kept to a minimum and there is no investment required. The club's car requirements are based on past history or estimated utilization. The dealer places the fleet at the club and each time the car is rented, the club divides the income with the dealer at a predetermined percentage.

But, remember, the dealer has his capital invested, not the club's. The dealer also provides a back-up "tournament fleet" with pick up and delivery service.

Both leasing and rental present another benefit to the golf club or facility. When introducing an initial fleet, a club may not be sure of just how many cars would be needed. Both a lease or rental program allows for adjustment to the size of the fleet. Therefore, the club is not committing itself to a golf car fleet. Therefore, the club is not committing itself to a golf car fleet which will not be totally operational and therefore, revenue producing.

In the long run, the decision to acquire a golf car fleet must be based on the growth the club or facility hopes to attain. The profit potential from one golf car has already been outlined. The potential from 10 times that many or 100 times that many can spell financial profit for the club willing to take the initial step.

And what club or facility could not use that extra revenue? Aside from cutting members yearly asessments, you could use the added revenue to make that much needed expansion to your present facilities, install golf car pathways, or maybe even build a swimming pool to further enhance your facilities.

Anyway you look at it, the golf club without its own fleet is not on a par with those who have them. □

SMOOTH RUNNING ENGINES

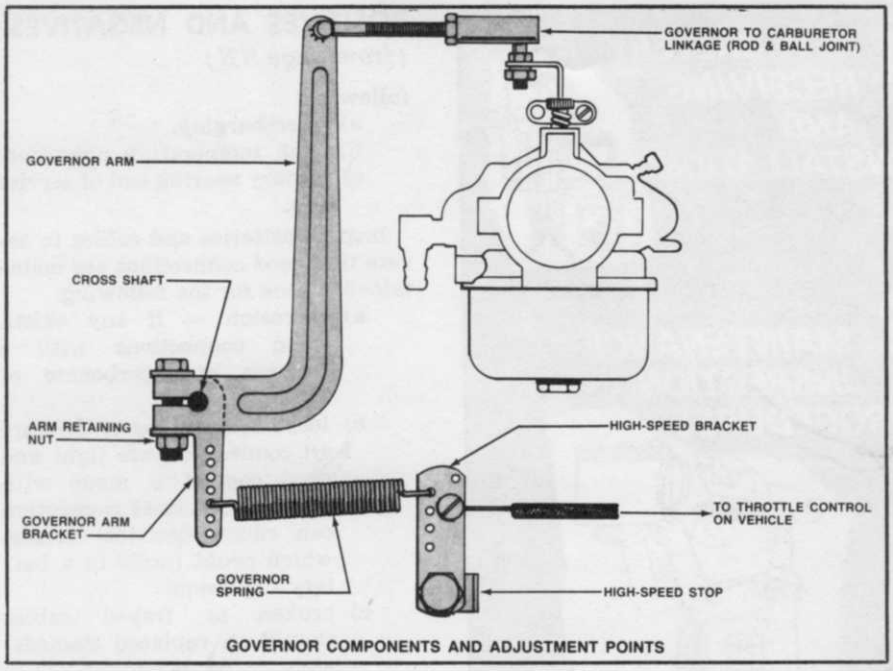
(from page GG)

setting). Finally, turn the screw back in until it is positioned half way between lean and over-rich settings. A properly adjusted carburetor will allow the engine to accelerate smoothly and operate with steady governor action.

Idle adjustment — A rough idle usually is caused by the idle speed being set too low, or the idle mixture screw misadjusted. First, turn the "idle speed" screw in clockwise to increase speed. If the engine still idles poorly, stop it and turn the "idle fuel" screw all the way in clockwise until it bottoms lightly **(don't force it)**, and then back out 1¼ turns. Next(re-start the engine and check the idle by turning the needle in or out ¼ turn at a time until a smooth idle is reached. The engine should operate satisfactorily when the carburetor is adjusted within the range of the manufacturer's specifications. If it does not operate satisfactorily, the carburetor needs cleaning or an abnormal condition exists in the engine.

Governor Adjustment: Governors, which maintain engine speed under changing load conditions, are set at the factory and further adjustment shouldn't be required unless the linkage becomes worn or broken. The governor should not be readjusted so that engine r.p.m.'s exceed the manufacturer's recommendation. If this is done, it will generally result in a blown engine.

However, the butterfly or throttle plate in the carburetor should be checked to make sure that it is in a wide-open position when the foot feed is clear to the floor. This check should be made with the engine stopped.□



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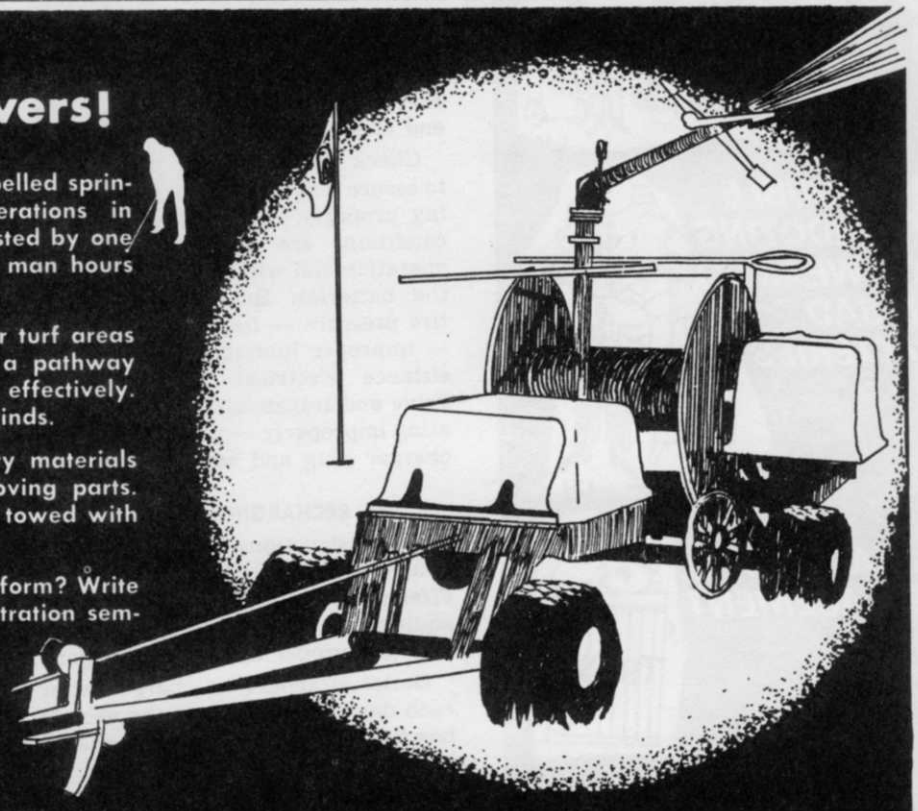

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POSITIVES AND NEGATIVES

(from page NN)

following:

a) overcharging;
b) high temperature operation;
c) battery nearing end of service life.

Inspect batteries and cables to assure that good connections are maintained. Check for the following:

a) corrosion — if any exists, clean connections with a solution of bicarbonate of soda and water;
b) loose connections — be sure all connections are tight and good contact is made with terminals. A loose connection can cause electrical arcing, which could result in a battery explosion.
c) broken or frayed cables should be replaced immediately;
d) grease and dirt on top of batteries should be cleaned off, as this may act as a current path and could cause discharge.

Check specific gravity of electrolyte periodically — following charge, be certain that two or more pilot cells in different batteries read between 1.250 and 1.280. If readings are low, check the charger to insure that proper charge is being returned to the batteries; check connections; check to see if batteries are nearing end of service life.

Check car operation periodically to assure that the vehicle is functioning properly. Any of the following conditions are detrimental to car operation and will shorten the life of the batteries: Brake drag — low tire pressure — improper alignment — improper lubrication — high resistance electrical connections — drive and transmission system operating improperly — poor condition of charger plug and receptacle in car.

RECHARGING HINTS

The instructions that come with your chargers have been prepared to offer you maximum benefit from the equipment. Familiarize your staff with the proper use of the chargers.

Batteries should be charged after each day's use as soon as the vehicle has finished its job. You may charge between rounds if time permits. Be certain cars are not released unless the batteries are fully charged.

Even though most vehicles are operated out in the open, it is important to remember that batteries produce explosive gases and sparks and flames must be kept away from them. Every battery should have this warning on it. **"Batteries produce explosive gases. Keep sparks, flame, cigarettes away. Ventilate when charging or using in enclosed space. If sulfuric acid from battery contacts eyes, skin or clothing, flush well with water. For contact with eyes get medical attention. KEEP AWAY FROM CHILDREN."** A further step to prevent accidents would be to only charge the vehicles in well ventilated areas.

TROUBLESHOOTING YOUR PROBLEMS

If you've maintained your batteries properly and still find that a vehicle performs less than a complete round of golf, don't give up. Recheck terminal connections for corrosion or loose connectors, broken or frayed cables. If these are okay, then test each cell of each battery for specific gravity. A variance of .030 between cells may spell trouble. Recharge the batery and retest for specific gravity of between 1.250 and 1.280. If a variance still exists, you should use a load tester to determine remaining life in the battery.

If the load tester indicates that batteries are no longer serviceable, replace them with new batteries. Should only one in the series of batteries be the weak link, it may be replaced with another battery of comparable age. This assures a relatively balanced electrical system.

REPLACING BATTERIES

Worn out batteries should be removed and battery trays, cables and holddown bars should be cleaned and reconditioned. Replacement batteries should be fully charged and checked for defects — broken cases or covers — and electrolyte level before installation.

Be certain that holddowns are firm, but not too tight. Replace cables, in series (positive to negative), after cleaning connectors and posts to assure the connection is tight.

WINTER STORAGE

In the winter all batteries not used should be cleaned, fully charged and electrolyte properly leveled. The same storage/charge cycle as for new-stored batteries applies. When put back into service, the same procedures as for startup of new batteries should be applied and batteries should be fully charged before use.

With this proper attention to battery maintenance detail, there's no reason for problems with your electric car fleet.

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4th hole at Pine Valley

The country's top golf courses use TORO irrigation systems. For a number of very good reasons:

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MORE THAN 50 YEARS OF EXPERTISE—TORO's learned a lot about total turf care in 50 years. And all that experience is available to you whenever you need it through our distributor network.

If you've seen a totally TORO golf course lately, we'll let the results speak for themselves. If you haven't, let us tell you more. Write TORO Irrigation Division, Dept. W-1273, P.O. Box 489, Riverside, CA 92502.

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We drove the Otis Turf-Aul hard in the rough to make sure it went easy on the green.

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TREE CARE
(from page 14)

will be up to two percent or 20,000 ppm.

The improved formulation of this product is unique to the widely acclaimed acid solubilized benomyl fungicide. Fungi-Sol is practically neutral (pH 6.8) as compared to the highly acid pH 1-4 range previously reported.

In another extension of the presently approved method, the non-pressurized capsules are replaced by a manifold system of plastic tubing fed and pressurized by a pressure sprayer containing benomyl suspension. Field test experience in 1973 pointed to the fact that lower pressure (10 psi) permitted greater amounts of the fluid to enter the tree than did higher pressure. While the manifold system is not registered yet, it too holds promise for the future.

We believe the Mauget feeder tube method offers yet another advantage. The tube is placed into the active xylem tissues of the tree (the last two or three growth rings). Systemic fluids are promptly carried away from this point and diluted by the fluids of the tree. This widens the formulating parameters and minimizes the difficulty experienced with high density woods.

By comparison, slant hole drilling goes well beyond the active xylem tissues. When many materials remain there for extended periods, a considerable amount of discoloration and cell degradation takes place. This further compounds the problem of healing and greatly increases the time of exposure to insects and disease.

As with the medical profession, the arborist who treats trees that are the property of others must be responsible for the residual amounts of chemical. In addition, the amount of liability assumed increases greatly. With both the quantity and quality of the contents in closed capsule systems established by extensive testing and Federal registration, an applicator is on much firmer ground in event of litigation.

In the medical field, chemotherapy is considered a high technology. There are obvious reasons why it should receive the same consideration in the tree care field. The corresponding level of professional responsibility has been established. Seminars on tree injection have been conducted by our company in cities across the nation. More will be conducted this year.

Additionally, the more than 500 experienced and highly trained arborists in the country utilizing the Mauget Process will provide a practical, continuing testing laboratory. They provide the means whereby new developments may be field tested to achieve more knowledge quickly. This network of "field scientists" will augment the university scientific force tremendously.

With greater knowledge, better communication, new systemic chemicals, improved methods of evaluation and application, it may be possible to overcome the pitifully small amount of funds expended into research on shade and ornamental trees.□

ONE INCH OF RAIN on an acre of ground amounts to 27,154 gallons of water. How is this determined? According to the Du Pont Company, one inch of rain on 43,560 square feet = 6,272,640 cubic inches of water or 3,630 cubic feet. A cubic foot of water weighs 62.4 pounds, so 3,630 cubic feet equals 226,615 pounds or 113¼ short tons. The weight of one gallon of water is 8.3 pounds, so an inch of water equals 27,154 gallons.

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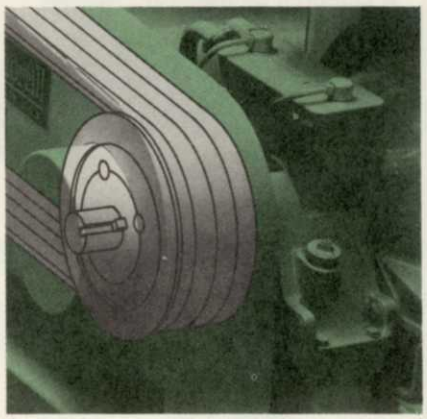

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Plus...

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OPERATIONAL MAINTENANCE *(from page 23)*

ly drained of all coolant and if the engine contained only water, enough water might be trapped in the engine after draining so that a cold snap could still cause cracking or other damage in the engine. Therefore, if antifreeze is going to be needed for winter storage anyway, it might just as well be used for the year-round coolant. When adding to a cooling system containing antifreeze, the operator should insure that even during the summer the additive consists of the proper ratio of water and antifreeze.

The use of the proper oil in an irrigation engine is the one area where more operators fail to follow the manufacturers recommendations and consequently shorten the life of their unit. Different fuels in the same basic engine require different oils. The type of oil that is just right for a diesel engine is not the right oil for a dry fuel engine. This is an area where the manufacturers recommendations should be checked before using any oil, and if an operator has to add oil during operational maintenance checks, he should insure that he adds only the recommended oil to the engine.

Each irrigation engine should be tagged by the operator with a label identifying the proper oil for that engine. Adding the wrong oil to an engine in many cases will do more harm than good to the engine. This is, of course, the time to check and clean all of the engine filters, and here again the manufacturers recommendations should be followed.

I would like to point out, while on the subject of manufacturers recommendations, that although all pump or engine manufacturers send out a packet of operation and maintenance instructions with their product, many times we find that these instructions are lost or misplaced during assembly or installation of the units and never reach the operator. It is important that distributors and installers of this type of equipment insure that the instructions reach the operator of the equipment or he has nothing to refer to in order to follow proper maintenance procedures.

If the pumping unit is powered by an electric motor instead of an internal combustion engine, the pump and maintenance remains the same, but the motor maintenance would consist of following a regular schedule of motor lubrication as recommended by the manufacturer.

Electric motors should not be greased every day, and, when greasing, the proper steps for flushing the old grease when installing new should be followed. Motor bearings can be ruined just as quickly by over greasing as by under greasing.

One other step to follow during operational maintenance of an electric motor driven unit is to insure that the area of air intake for the motor is free of weeds and trash that would prevent a full flow of air to the motor for cooling. The base or supports of the electric motor should be such that it will not trap and hold water directly under the air intake of the motor. Should water be held in this area it can be pulled into the motor along with the air by the cooling fan. Although most motor windings today are protected against this type of moisture, minerals contained in this water can sometimes attack the windings causing early winding failure.□

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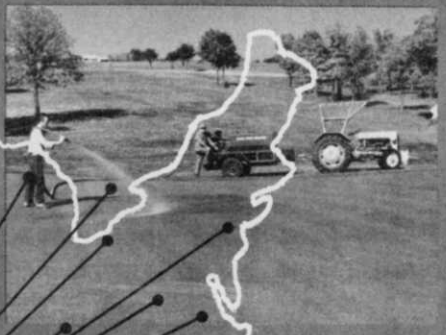

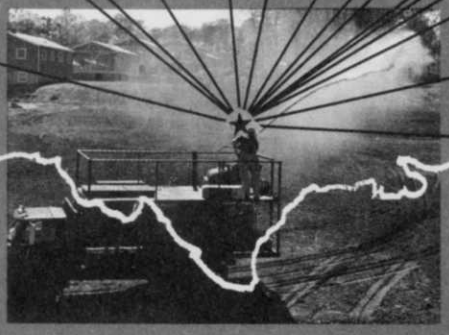

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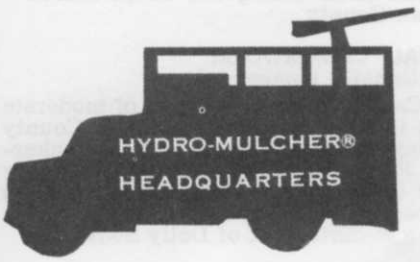

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—insect report—

TURF INSECTS

SOUTHERN FIRE ANT
(Solenopsis xyloni)

TEXAS: Numerous mounds of this ant and *S. geminata* (fire ant) noted on home lawns in Pearsall, Frio County, and in College Station, Brazos County.

GRASS WEBWORM
(Herpetogramma phaeopteralis)

FLORIDA: Heavy on turf grasses, mainly Bermuda grass, in south area; population 85 percent *H. phaeopteralis* and 15 percent *Crambus* sp. Severely damaged 50 percent of half-acre Argentine Bahia grass lawn at Leesburg, Lake County. Damaged mixed lawn grass at Orlo Vista, Orange County. Heavy on 750-1000 square feet of St. Augustine grass in yard, and damaging mixed grass lawn (including St. Augustine grass) at Gainesville, Alachua County.

SOUTHERN CINCH BUG
(Blissus insularis)

CALIFORNIA: Nymphs and adults in St. Augustine grass lawn at Bakersfield, Kern County. This is a new county record.

RHODESGRASS SCALE
(Anotonina graminis)

CALIFORNIA: Adults on St. Augustine grass at San Clemente, Orange County, a new location.

BERMUDAGRASS MITE
(Eriophyes cynodoniensis)

FLORIDA: Still heavy in Bermuda grass golf course at Sarasota, Sarasota County; Naples, Collier County; Ft. Lauderdale, Broward County; and Miami, Dade County.

SOFT SCALE
(Toumeyella pini)

MISSISSIPPI: Collected from slash pine in Greene County during late September. This is a new county record.

BENEFICIAL INSECTS

FLEA BEETLE
(Longitarsus jacobaeae)

OREGON: Appears established at test site in Marion County from population of 500 beetles released last November. Adult feeding damage on tansy ragwort leaves moderate in 64 square-foot caged area. About 10 adults noted, indicates substantial number have completed one generation. Additional 500 beetles released into a cage near 172 release site.

BRACONID WASP
(Chorebus rondanii)

MASSACHUSETTS: Reared from puparia of *Ophiomyia simplex* (asparagus miner) collected at South Deerfield, Franklin County. This is a new United States record. Introduction of *C. rondanii* into U. S. was probably accidental.

TREE INSECTS

ELM LEAF BEETLE
(Pyrrhalta luteola)

WASHINGTON: First adult emergence noted March in Wenatchee, Chelan County.

FALL CANKERWORM
(Alsophila pometaria)

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TROUBLE SHOOTING

(from page 24)

turbine pump may not be delivering to the centrifugal quite as much water as the centrifugal is trying to pump. If the difference in the amount of water is slight, this might be hard to spot as the pump may not be noisy and the pressure gauge may not fluctuate much. The pressure will be just slightly under design condition. A combination, vacuum-pressure gauge on the suction line or the suction side of the pump will show the operator if he is maintaining a steady input pressure to the pump or fluctuating between pressure and vacuum on the suction side of the pump.

Many systems are being put in today with the pump having a flooded suction. This does not automatically avoid the problem of insufficient water to the pump. If the suction piping is too long and/or too small the friction losses in the line can still prevent sufficient water to get to the pump.

There are many other ways by which we can fail to get sufficient water to the pump, much too numerous to go into here.

If an operator will remember that if the impeller of the pump is free of foreign objects and is turning in the right direction—the pump is working.

If he will then go on and find out why he is not delivering water to the pump or not delivering sufficient water to the pump, he will have the $28.00 end of his trouble solved and can then go on to the .17 cure.□

Cast Iron Pipe Research Assoc. Offers Booklet

The many advantages of a modern golf course irrigation system are explained and illustrated in a 24-page booklet offered by Cast Iron Pipe Research Association.

It tells about the increasing demands imposed on golf courses by the tremendous growth in player popularity. It also updates in concise form the facts on proper watering systems and gives general design considerations for planning an irrigation program.

For a copy of this booklet, circle (719) on the reply card.

GOLF DEVELOPMENT

(from page 10)

California and Texas each (26), Ohio (21), North Carolina (20), Colorado and Michigan each (14), Indiana and South Carolina each (11), Illinois and Washington each (8), Arizona (7) and Virginia (6).

At year's end, NGF files also contained a list of 292 prospective golf course developments. Regulation courses comprised 245 of the prospects; 23 were for executive type courses and 24 for par-3 layouts.

Leading states in the prospect list were California (29), Florida and Ohio (19), Colorado (18), Virginia (17), Michigan (15), Illinois (12), Arkansas, Indiana and North Carolina (11), Arizona and Pennsylvania (10).

As the nation's official clearing house for golf information, the National Golf Foundation has records on golf course growth since 1931. Each year all new courses are added to NGF's computerized national inventory of golf facilities.

For 1931 — the first year for which figures are available — there were 5691 golf courses of all types in play. In 1961 — thirty years later — the total was 6623 or a net increase of only about 16%. But during the period from 1961 through 1973 the inventory jumped to about 10,870 — a whopping increase of 64% in 12 years! A look at the relative growth of all types of golf courses in play from 1931 through 1973 is shown below.

Land costs and operating expenses, including rising taxes, make it increasingly difficult for member-owned clubs and private courses to financially survive in many communities.

More financial resources are available to municipalities. Among them are sale of general obligation or revenue bonds, Federal grants, private development with leaseback and outright public or private donations. Among the Federal programs that have assisted municipalities greatly in recent years are those of the Bureau of Outdoor Recreation (Department of Interior). These are fifty percent matching grants for land acquisition and development of outdoor recreation facilities and the Federal surplus property program whereby certain Federal lands are conveyed gratis when used for recreational purposes.

Current emphasis on recreation and open space has created more official and citizen support for golf/recreation complexes. Such complexes often include, in addition to a well designed and constructed golf course, tennis courts (sometimes lighted for night play), swimming pools, artificial ice skating rinks, playground and picnic areas, a community center building, camping, hiking, nature study and sometimes ski areas.

All the above listed factors are making it easier to sell a municipal golf course proposal to the public. While many new municipal golf courses have been built in recent years, NGF studies reveal there is still an enormous need for more public golf facilities in numerous areas throughout the nation.

Table 3. Four decades of golf course growth.

TYPE	1931	1973	CHANGE
Private	4448	4825	+ 377
Daily Fee	700	4610	+3910
Municipal	543	1436	+ 893
Totals	5691	10,871	+5180

The tremendous growth in public golf courses reflected in the above figures brings clearly into focus the trend in golf course development in recent years. **Golf no longer belongs solely to the few; it is Everyman's game.**

Population growth, urbanization, more leisure time and increased personal income and mobility continue to put enormous pressure on public recreation facilities including golf courses. A good solution to the demand is more municipal courses owned and operated by cities, counties, states or regional park-recreation districts.

Why municipal golf courses? Practical politics and economics dictate such action.

Providing assistance in the planning and development of golf courses is one of the principal functions of the National Golf Foundation. Highly trained NGF facility development consultants are available to assist golf course planning groups in making feasibility studies to ascertain their need for golf and outlining a plan of action including methods of financing and operation. Facility development consultants are located at eight strategic locations throughout the country. For further information on these services contact Don Rossi, Executive Director, National Golf Foundation, 707 Merchandise Mart, Chicago, Illinois 60654.□

Future Of Turf Research Toward The Basics

The need for stepped-up research to obtain basic information related to turfgrass was emphasized by a Cornell University scientist.

Prof. John E. Kaufmann, a turf specialist at the N.Y. State college of agriculture and life sciences, Cornell, said that the trend is toward basic research in turfgrass science.

"Turfgrass science must progress beyond the point of merely summarizing research information based on observations," he said.

Kaufmann made his remarks in a talk discussing future directions of turfgrass research at the Cornell Seed Conference in December.

Pointing to the uniqueness of turfgrass science, Kaufmann said that many species of grasses are used as ground cover for home grounds, athletic fields, and recreational areas under a wide range of climatic and soil conditions across the country.

"Despite tremendously divergent growing conditions facing turfgrasses, they are universally expected to do well," he pointed out.

Home lawns, for example, are subjected to wear and tear of a variety of physical as well as environmental stresses such as human traffic, heat, cold, drought, shade, and sometimes floods.

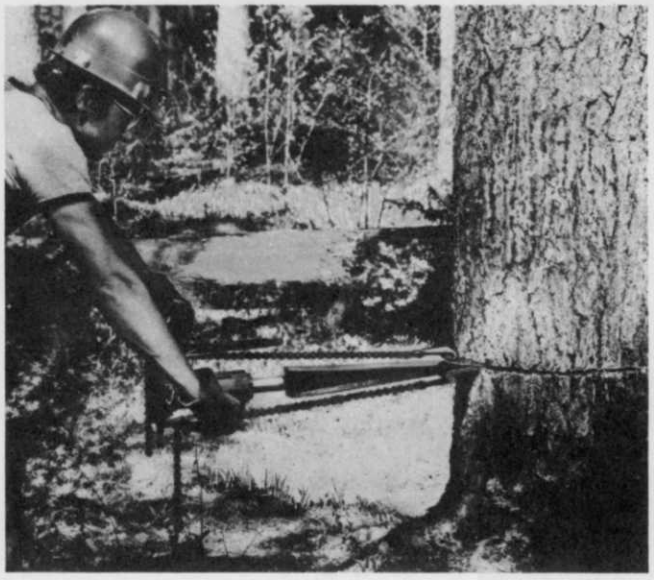
"No one dares to walk on vegetables and flower beds, yet people expect the lawn to do well under heavy traffic and play," Kaufmann pointed out.

Growth and performance of grasses are highly variable because of extreme environmental variations under which they are to survive.

"What works for one turfgrass professional does not necessarily work for another," he said.

In developing research, emphasis should be placed on the effect of stressful conditions on growth, development, and related characteristics of the grasses.

"The object is to come up with a prediction of the performance of a turfgrass species or variety under a specific set of growing conditions," Kaufmann said.



SAFETREEJACK: Great Eastern Enterprises, Inc., Bucksport, Maine

The wedge in the center of the jack penetrates between shims placed in the saw kerf of a tree. The hydraulic ram is hand-operated, allowing the operator to wedge just the right amount. Result is easier sawing with fewer pushovers, less damage to undergrowth, easier skidding and no damage to property. Unit can be used to give 360 degree selective felling to ease a tree over a predetermined spot. Recommended size is 5 ton. For more details, circle (701) on the reply card.

PROPANE-POWERED GOLF CAR: Model Tee Cart Corp. Keyport, N.J.

This four-wheel golf car powered by propane will be available in most sections of eastern U.S. this spring, says the manufacturer. No powering batteries to charge, no gas and oil to mix and fill, no fuel pump or carburetor — virtually little or low maintenance. Car weighs only about 850 pounds. Has rugged steel chassis and fiberglass body. Length is 96 inches, width 47 inches, speed 12 mph. One 33 lb. ICC propane cylinder provides the power source.

WALKER/RIDER: Gravely, Clemmons, North Carolina

With just a flick of the wrist the Commercial 12 tractor is converted from a riding unit to a well-balanced walking unit. Just pull one pin and riding sulky is released. Tractor features instant forward and reverse, all-gear-drive, electric starter. Mower is a 40-inch rotary. It features right angle bevel gear drive through a cast iron housing with tapered roller bearings. For more details, circle (703) on the reply card.

POWER KART: G.E.M. Products, Inc., Carol Stream, Ill.

Here's a three wheel turf vehicle that's powered by an eight horsepower engine. Unit has seat capacity for two people. It hauls up to 350 pounds in its all steel 23 inch by46 inch by 8 inch box with tailgate. Power Kart has variable speed, automatic torque converter primary drive. Low pressure tires protect turf from compaction or other damage while at the same time allow unit to buck through mud and sand. For more details, circle (704) on the reply card.

BENT ON BETTER FAIRWAYS

By DR. JOHNNY R. THOMAS
Research Director
North American Plant Breeders

The bentgrass fairways of this Pennsylvania course (top) become most inviting to area golfers. Note the well-groomed appearance and overall beauty. Bent fairways can be kept in top shape with modern irrigation (center). The fairway at the bottom is on an Illinois course. Many champion golfers prefer bentgrass because it improves shotmaking and reduces the chance for divots.

NOTHING contributes more to the overall beauty of a golf course than healthy, well-groomed fairways. The feelings of exhilaration and mental relaxation that result from the sport of golf when played on acres of green grass are difficult to describe, but are well understood by all lovers of the game.

Unfortunately, fairways are usually at the mercy of the economic situation prevailing at each course. Greens and tees must be maintained to certain minimum standards no matter what the budget is. Thus when a budget is tight, fairways will suffer relatively more than will tees and greens.

However, the increased popularity of golf and the greatly expanded inter-club and tournament schedules means more attention must be paid to fairways. The "greener grass" of other courses can be embarrassing as well as costly (in lost memberships).

In recent years there has been increasing interest in creeping bentgrass as fairway turf. The increased interest has been mainly caused by a greater use of fairway irrigation; improvement in equipment; a trend toward lower cutting heights for fairways; and the development of varieties bred especially for golf courses such as Emerald and Penncross. With the well known ability of creeping bentgrasses to tolerate low cutting heights and to rapidly heal divots and other injuries, even with heavy play, the bents can make excellent fairways.

In addition to looking first class, bent fairways improve shotmaking and reduce divots by holding the ball up better.

If a "perfect fairway grass existed, it would probably have the following characteristics: The leaves would be rather broad and stiff to hold the ball up firmly. It would tolerate a cutting height down to at least one half inch and also possess rapid healing characteristics. It should also be seed propagated, wear resistant, and not so vigorous as to require excessive management due to thatch or "puffyness."

At this time such a "perfect" grass does not exist. The two species most nearly fitting the bill are bluegrass and bentgrass. The better bluegrasses possess the stiff leaves and aren't difficult to manage, but only the very best varieties under almost ideal conditions can persist for any length of time under a one half inch cutting height. At this height wear tolerance is low and healing is very slow.

On the other hand the creeping bents will persists nicely at one half inch or less. They will retain good wear resistance and heal rapidly. However, their leaves are not stiff and upright and excessive vigor leading to thatch and puffyness can be a problem, particularly with improper management.

Seventy-one percent of the complaints against bentgrass in a recent survey were (1) it requires too much chemicals and (2) it produces too much thatch. The use of less aggressive varieties such as Emerald and proper management can do much to eliminate the latter problem.

The other cool season species offer little hope of ever being bred to produce a good fairway variety. The colonial bents have all the problems of creeping bents and few of the advantages.

Colonial bent usually competes poorly with Poa *annua*, will not heal rapidly, and is more disease susceptible than creeping bent.

The red fescues, particulary the newer varieties such as Highlight and Jamestown, can form excellent fairway turf in the shade. However, they don't compete well in the sun and heal injuries very slowly.

The new turf-type perennial ryegrasses, such as Manhattan and Pennfine, are excellent for seeding injuries and bare spots on fairways and tees. However, they also spread very slowly and aren't completely winter hardy in the northern areas.

THE COST OF MAINTENANCE

What are the economic aspects of creeping bent fairways? Is their average maintenance cost significantly greater than that of a mixed bluegrass, fescue, Poa *annua* type fairway? Although generalizations are difficult and vary with the local area, the maintenance cost of a creeping bent fairway will usually average slightly higher than other types. However, ten percent of the golf course superintendents recently surveyed indicated bent fairways would be cheaper in the long run, despite higher initial cost and high chemical cost.

Fairway irrigation is essential with bent fairways, but the total water volume used should not significantly exceed that of any other type fairway cut at the same height. The fertilizer bills should also be comparable. Bent fairways should be fed only enough to keep the turf healthy and maintain good color. It is not true that bents must be fertilized much more heavily than other grasses. Over fertilization con-

(continued on next page)

Bent Down South

Golfers in southeast Texas may soon be playing on turfs of creeping bentgrass.

Bentgrass, which grows year round in Texas, is currently under fullscale research by the Texas agricultural experiment station. The project is under the direction of Dr. Richard L. Duble, associate professor in the department of soil and crop sciences, Texas A&M University.

The grass is well-known throughout the cool, humid northern United States, but research suggests that with proper culture it may also be grown in hot, humid environments.

Creeping bentgrass has a growth habit similar to bermudagrass and forms a very close-knit sod that makes a smooth, true putting surface with excellent resilience, emphasizes Duble. Bentgrass has a softer texture than bermudagrass and because it grows year round the problems and inconveniences of overseeding bermudagrass can be avoided.

"While the grass will grow in a wide variety of soil conditions, it produces the best turf in slightly acid soils where fertility, aeration and moisture relationships are good," Duble said. To meet these requirements, golf greens must be constructed according to the specifications established by the United States Golf Association Green Section in cooperation with the Texas agricultural experiment station. Essential features of these specifications include subsurface drainage, a perched water table and a highly permeable soil mixture.

On hot summer days, light irrigation or syringing may be required at noon to cool the turf below atmospheric temperature. On occasions two syringings may be necessary, but with automatic irrigation systems and properly constructed greens little inconvenience is encountered.

Bermudagrass greens constructed according to USGA Green Section specifications can easily be converted to bentgrass with a herbicide treatment which allows immediate seeding of bentgrass. Two seeded varieties of bentgrass, Penncross and Emerald. are currently recommended in Texas.□

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tributes to the potential thatch and puffines problem.

The mowing frequency of bent will be greater than for other grasses. It will probably average about ½ to 1 more mowing per week than other cool season grass fairways. Thatch is a potential problem. But, if the grass is mowed frequently, particularly when growing vigorously, and fertility is not excessive, thatch formation can be controlled.

Weed control is usually less of a problem with creeping bents. Even at one half inch they are very competitive with most weeds. By rapidly healing divots and other injuries, weed invasion is minimized. However, in some areas, the fungicide bill may be higher than that of other cool season grasses. Although creeping bents cut at one half inch or more are much less subject to disease than the putting green bent, they may still require a little more protection than fairways of the other cool season grasses.

Seaside, Emerald, and Penncross are the only seeded varieties available at this time. Emerald and Penncross were bred specifically for fine turf usage. Although Seaside is not a bred variety, being merely a conglomeration of seed from wild creeping bents adapted to the Pacific Northwest, it performs adequately on fairways in some areas. Excellent data from Michigan State University indicates the relative performance of these varieties for tees and fairways.

Penncross is well established in the turfgrass industry and usually does a good job on greens and tees. Penncross is the most vigorous creeping bent and as such it is often difficult to manage on fairways.

Emerald is the newest creeping bent to become available. It also does a good job on greens and tees, but additionally has looked promising for fairway use. Although more dense and vigorous than Seaside and finer textured than Penncross, it does not possess the extreme vigor of Penncross and thus is easier to manage. However, the uniformity of Emerald, which is so desirable for greens, might be a potential problem on fairways — where genetic diversity is usually desirable.

In summary, bentgrass should be considered for fairway use — to give your cause and your players the competitive edge.□

ASPA Winter Conference Slated For New Orleans

The annual mid-winter conference of the American Sod Producers has been scheduled for the Ramada Orleans in the city of New Orleans for February 7-9. This represents a change from a previously scheduled date, but the change was made in order to avoid conflicts with other important meetings within the industry, according to Jack Kidwell, ASPA president.

The sessions will be devoted to two major areas. The first will be centered around marketing and its importance to the success of the sod producer. The use of mini-conferences, participation by various members in a discussion of their effective procedures and techniques and a free exchange of factual information will highlight the marketing sessions.

The second phase of the conference will deal with the involvement of the sod producer in government and regulations which affect the industry. ASPA Council William Harding of Lincoln, Nebraska will provide the latest up-to-date information and will discuss regulations of various governmental agencies and how they should be handled and complied with by the sod producer.

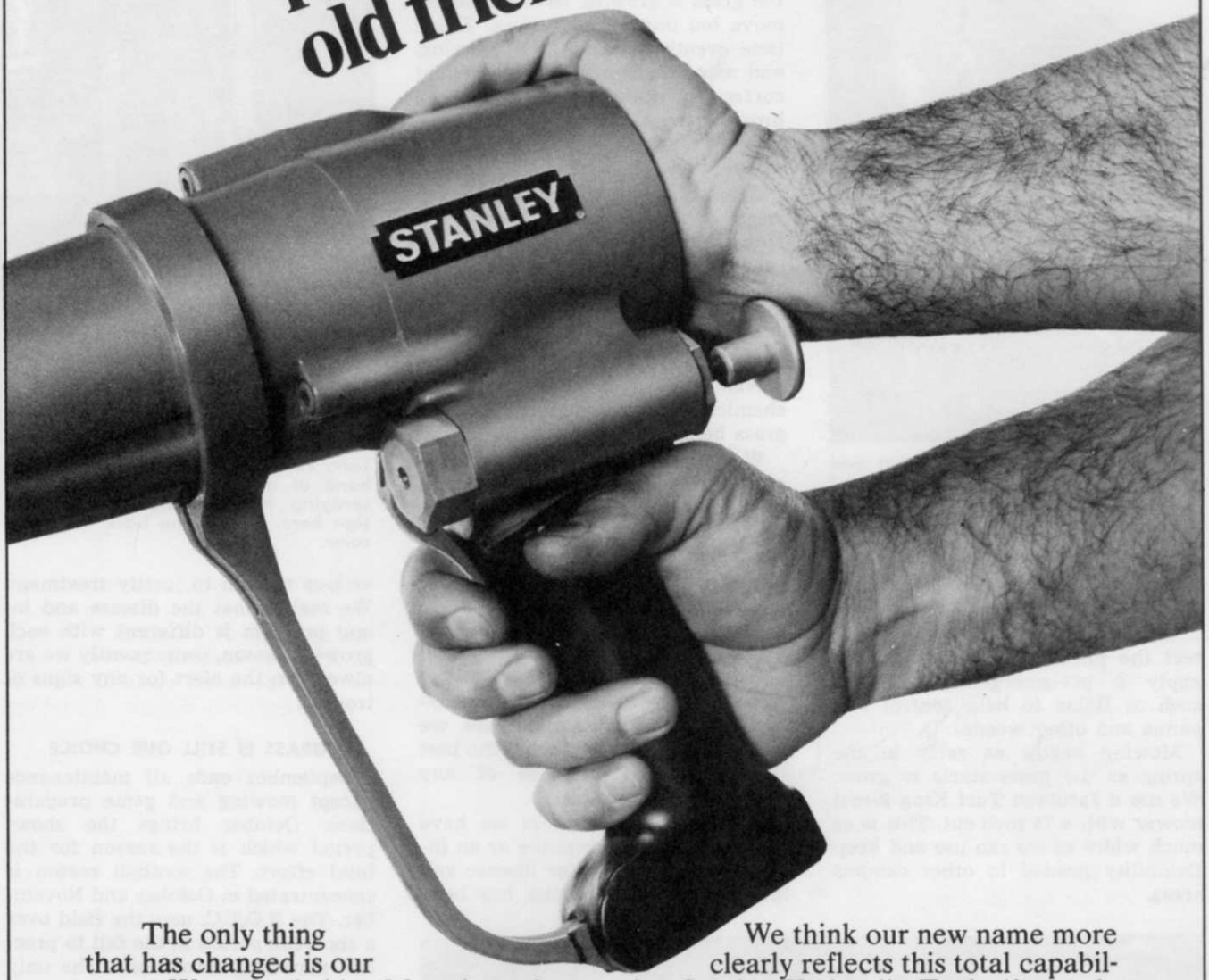
Because New Orleans is a most unique city, a number of social events are being planned and emphasis is being placed on attendance by the wives as well, along with employees and staff representatives of the various member firms.

Performance of Bentgrass cultivars, Tee-Fairway management[1]

	Ratings ½" cut
Seeded Creepers	
Emerald	2.2
Penncross	2.5
Seaside	2.9
Colonial (seeded non-creepers)	
Exeter	3.7
Astoria	3.9
Hofior	3.4
Boral	3.9
Highland	4.2
Vegetatively propagated creepers	
Pennpar	2.1
Cohansey	2.8
Toronto	2.2

1. Performance data were collected at Michigan State University from 1968-1973. Scale of ratings: 1-10 with one best.

A bright new name for a reliable old friend



The only thing that has changed is our name. We were Ackley Manufacturing Co., a subsidiary of The Stanley Works. Now, we are Stanley Hydraulic Tools. You'll find the same experienced people at the same address. We offer the same broad hydraulic tool line—the same high standards of product quality. Our generous service and warranty policies are unchanged. And our customers can still count on the most thorough in-field assistance and parts programs in our industry.

We think our new name more clearly reflects this total capability. Stanley Hydraulic Tools (formerly Ackley Manufacturing), Division of The Stanley Works, 13770 S.E. Ambler Road, Clackamas, Oregon 97015. Telephone: (503) 659-5660.

STANLEY®

helps you do things right

For More Details Circle (139) on Reply Card

Painted designs are worked out and scaled on the drawing board. Here, I use a tape measure to make an accurate field check. Mistakes show up quickly.

FORWARD PASS

(from page 13)

rect the pH if needed. We usually apply a pre-emergence herbicide such as Balan to help control Poa annua and other weeds.

Mowing begins as early in the spring as the grass starts to grow. We use a Jacobsen Turf King 3-reel mower with a 76 inch cut. This is as much width as we can use and keep flexibility needed in other campus areas.

Cutting height in the spring is kept at ¾ of an inch to encourage spreading of the turf. By keeping a smooth even surface, we avoid the scalping that can result from low mowing.

During the latter part of July we change the cutting height to 1½ inches for the balance of the season. This is a little high for Bermuda but it encourages the turf to thicken, resulting in a softer more plyable playing surface.

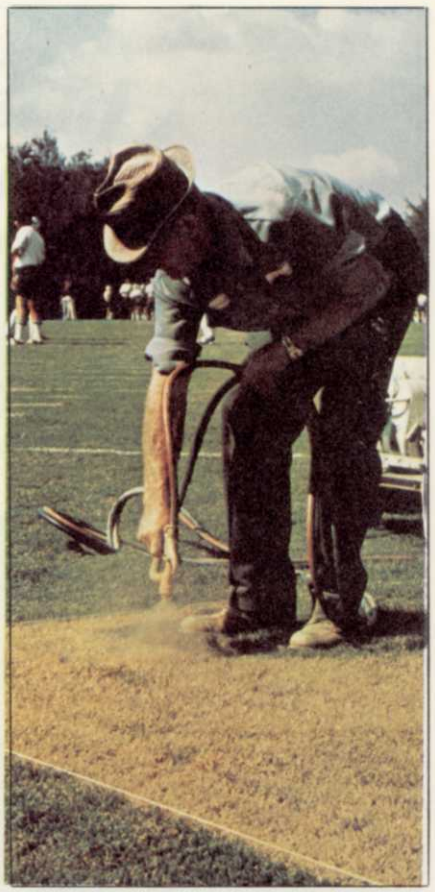
Mowing is scheduled at the rate the grass is growing so as not to remove too much leaf surface. Every time weather delays the mowing, and more than onethird of the leaf surface is removed, we see some brown areas. Even though the brown areas recover rapidly, we try to avoid the problem.

Grass is not as competitive as the weedy plants and that is why we spray at least three times during the growing season to control such pests as crabgrass, crowsfoot, knotweed, and chickweed. We usually mix Trimec and MSMA to get the best control of broad-leaved and narrow-leaved weeds in Bermuda. The chemical selected depends on the grass being treated.

We have found that a surfacant such as Di-Aqua is very important in getting better coverage and control. It makes the water wetter by breaking down the particles to spread the chemicals more evenly.

With the Myers 200 gallon sprayer and 20 foot boom we can cover the 1¼ acre field in nine passes. We apply all liquid products with this sprayer by just changing the spraying tips. As to application rate, we follow the labels and that is the best recommendation for use of any chemical.

In the last three years we have not used either a fungicide or an insecticide. We watch for disease and insect damage, but none has been serious enough to justify treatment. We realize that the disease and insect problem is different with each growing season, consequently we are always on the alert for any signs of trouble.



Terry Turner, my assistant, has the fine hand of an artist when it comes to spraying. He's working on a goal design here. Turf in the back is natural color.

GRASS IS STILL OUR CHOICE

September ends all maintenance except mowing and game preparations. October brings the show-period which is the reason for the total effort. The football season is concentrated in October and November. The R.O.T.C. uses the field over a six week period in the fall to practice marching formations. The only other use allowed on the field is band practice one time before each game.

We have proved that live turf can satisfy our needs for beauty and utility and our annual costs are less than the interest would be for an investment in artificial turf. It has been estimated that an expenditure of approximately one half million dollars would be required to put artificial turf on our field. At the current rate of interest, the interest on that amount of money would more than pay the maintenance cost on our live turf.□

Practice on the field by the majorettes and the band is restricted. We want to limit the damage that a foot can do when it continues to step into the same spot. These girls find the Bermudagrass much to their liking, however.

FERTILIZE TREES IN ONE THIRD THE TIME AND ABOUT HALF THE COST USING JOBE'S TREE FOOD SPIKES.

Here's proof when fertilizing a 5" tree:

Old Method[1]

Bulk 16-8-8 fertilizer—$70/ton
(Average price throughout U.S.)

2 lbs./inch of trunk diameter = 10 lbs. × 3.5c/lb.	$ .35
½ hr. labor @ $4/hr.	2.00
Labor and materials	$2.35

$2.35 ÷ 5" tree = 47c/inch of diameter
No allowance made for depreciation, amortization, breakage of auger, mistakes, etc.

[1]*Using electric auger.*

Jobe's Tree Food Spikes Method[2]

5 spikes 16-8-8 fertilizer—22c/spike

1 spike/inch of trunk diameter	$1.10
5 min. labor @ $4/hr.	.33
Labor and materials	$1.43

$1.43 ÷ 5" tree = 29c/inch of diameter, based on 20 case order.

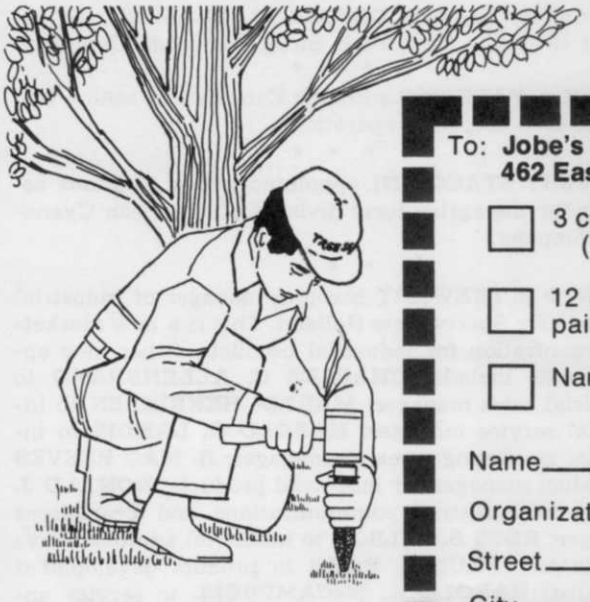
[2]*Based on results of university field tests and recommendations.*

Professional tree and turf men who use Jobe's Tree Food Spikes can save 50% and more in labor and materials.
Recommend the fall fertilization of trees now to your customers. Save time and money by using Jobe's Tree Food Spikes. Order from your local supplier—or write for his name.

Jobe's® The instant meal for hungry trees.

TREE FOOD SPIKES

International Spike, Inc., 462 East High Street
Lexington, Ky. 40508



To: **Jobe's Tree Food Spikes**
462 East High St., Lexington, Ky. 40508

☐ 3 cases Tree Food Spikes @ $30 per case, f.o.b. Paris, Ky. (105 spikes—40 lbs. per case)

☐ 12 cases Tree Food Spikes @ $25 per case, freight prepaid.

☐ Name of local supplier

Name_____
(Please print)

Organization_____

Street_____

City_____ State_____ Zip Code_____

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COMPARE

Any crew can transplant one tree...but only Vermeer Tree Spades transplant a forest

You're looking at the profit end of a low-cost, high-production tree transplanting program—with "The Diggin' Dutchman's" TS-44A Tree Spade from Vermeer. Compare it with a whole crew of laborers and you'll see what we mean. The TS-44A requires no coffee breaks . . . no lunch hours . . . no overtime wages . . . just an occasional tank of gas to keep its hydraulically-operated spades digging, balling and transplanting a forest of trees up to 4" in diameter. Saves you thousands of dollars annually because one man can handle the entire job in minutes. Interested? Write "The Diggin' Dutchman" for all the facts.

. . . also compare Vermeer's complete line of labor-saving Stump Cutters.

Our 25th Year

THE DIGGIN' DUTCHMAN

VERMEER TREE EQUIPMENT DIVISION
7201 NEW SHARON RD. • PELLA, IOWA 50219

industry people on the move

PATRICK J. NUSS appointed manager of employee relations for The Toro Company.

* * *

BERNARD STONEHOUSE, named manager of contractor marketing services for Toro Irrigation Division. In other company moves **JOHN S. MACLAUGHLIN** joins the company as an irrigation specialist, and **SARA L. ROMSPERT** has been named supervisor for order processing and customer relations.

* * *

WARREN G. "SKIP" PURDY III, promoted to vice president and general manager of Foamspray Chemical, Inc. **NEAL HARVILLE** becomes general manager of the company's new division, Nu-Ag West. His wife is the marketing director. **DARRELL KENNEMER** appointed sales representative.

* * *

FRANK J. PRATT becomes regional sales manager for the Outdoor Power Equipment Division of FMC Corporation. He will be working with distributors in New York, Mass., R.I., Conn., Pa., New Jersey, Maryland, Delaware, Va. and Washington D. C.

* * *

WILLIAM A. MILLSON joins Outdoor Power Equipment Division of FMC Corp. as regional manager for Tenn., Ky., North and South Carolina, and Va.

* * *

TIMOTHY P. SCHMITT named to the newly created post of financial analyst for the Outdoor Power Equipment Division of FMC Corporation.

* * *

DR. DONALD B. PFLEIDERER, becomes sales manager for the professional division of The Bishop Company, a subsidiary of Lebanon Chemical Corporation. He was formerly director of technical services for Agrico's Turf and Garden Products Div.

* * *

EDWARD J. CAMPBELL assumes position of senior vice president — agricultural equipment division, J. I. Case Co. He succeeds **DONALD C. BLASIUS** who resigned to join a New York Stock Exchange Company.

* * *

FRANK J. PALERMO succeeds Campbell as senior vice president — corporate operations.

* * *

ROBERT STACCHINI appointed public relations assistant for the agricultural division of American Cyanamid Company.

* * *

DAVID E. STEWART becomes manager of industrial products for Sperry New Holland. This is a new marketing organization for industrial products. Other new appointments include: **CHARLES C. ALLENBRAND** to industrial sales manager; **MARTIN HENRIKSEN** to industrial service manager; **HAROLD G. LANDIS** to industrial marketing research manager; **R. MAC REEVES** to product manager for industrial products; **DONALD J. SHAW** to industrial communications and promotions manager; **ROSS B. WILSON** to industrial administrative coordinator; **PAUL E. ROBB** to product development specialist; **HAROLD K. McCAMPBELL** to service analyst.

Broadleafs controlled positively

with maximum safety to sensitive grasses, ornamental shrubs, trees

BROADLEAF WEED control with herbicides has been a hit and miss proposition so long that many find it hard to believe positive control is indeed here at last.

Trimec Turf Herbicides can quickly demonstrate what we mean. Positively.

This patented herbicide combination can be relied on to overcome your worst broadleaf pests, whatever they may be. Trimec alone attacks the whole spectrum of broadleaf weeds, wiping out hard-to-kill species without extra attention or expense.

If you are responsible for maintaining weed-free turf, get on top of your broadleaf problems with Trimec. No other product offers you all these advantages:

- Unequalled spectrum of control
- One application is usually enough
- Minimal chemical dosage required
- Rapidly biodegraded in the soil
- Maximum safety to sensitive turf, trees and shrubs.

Applied according to directions, when weeds are actively growing, Trimec's synergistic punch knocks out toughest broadleafs while making it possible to minimize hazards to desirable vegetation. The required dosages are so low there has yet to be a single complaint of ornamentals being damaged due to root uptake of dicamba. Likewise, grass species needn't be discolored or damaged using Trimec. In fact, Gordon's "Bentgrass" formulation is recommended for use on sensitive grasses, while the "Fairway" formulation is recommended for all other commercial turf applications.

Trimec's active ingredients—2,4-D, MCPP and dicamba—are no secret. The real secret to the product's superior performance is the synergistic effect of these compounds in combination. Their weed control effects are remarkably increased. Broadleaf pests resistant to all but overwhelmingly high levels of its individual components respond to Trimec—quickly, consistently and with virtually 100% kill effected.

Just ask anyone who has tried these superior herbicides. Controlling broadleaf weeds without Trimec is simply doing it the hard way. Try Trimec and relax for a change.

U.S. Patent 3,284,186

trimec
TURF HERBICIDES®

PBI-GORDON CORPORATION
300 SOUTH THIRD STREET KANSAS CITY, KANSAS 66118
Telephone: 913/342-6780

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Turf-Maker is specifically designed for professional turfmen, landscapers and sod growers.

Brillion

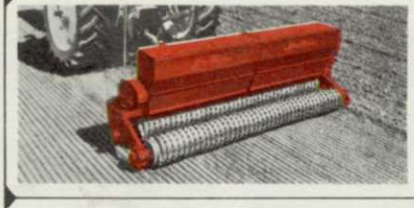
TURF-MAKER

—the most precise grass seeder made

Brillion's Turf-Maker is for you—if you want to seed the finest grass seeds and lawn mixtures with miserly accuracy over large areas. It crushes, seeds and rolls in one pass—enables one man to seed up to 50 acres per day without extra help, equipment or seedbed conditioning.

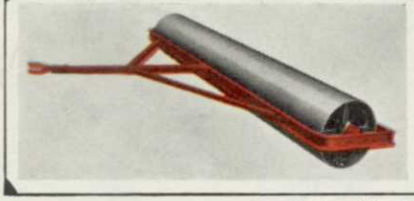
Turf-Maker gives you exclusive Micro-Meter adjustment for an infinite range of seed settings—Brillion fluted rolls, the most accurate seeding mechanism known — and the unique reversible sprockets for a dual range of rate settings. The results: Full, thick stands at up to 50% seed savings over conventional methods. It's the best for sod seeding.

You can order Turf-Maker in 8′ and 10′ seeding widths. Options include transport wheels for both sizes and 3-point Category II pick-up for the 8′ model. Seed better—save more with Brillion. Mail coupon.



LANDSCAPE SEEDERS

— 3 sizes for heavy seeding rates — 5'4" and 8' pickup models. 8' and 10' drawbar models.



SMOOTH ROLLERS

— for smoothening humps and winter heaves in established turf. Single and triple gang models, 9' to 20' widths.

Landscape Tools with a Future—for You!

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Dept. LS 41-14,
Please send me information on the following:

FEMA

○ New Turf-Maker ○ Smooth Rollers
○ Landscape Seeders ○ Name of nearest Brillion dealer

Name_____
Address_____
City_____ State_____ Zip_____

LS-135R

meeting dates

Ohio Chapter, International Shade Tree Conference, annual meeting, Sheraton Columbus Hotel, Columbus, Ohio, Jan. 27-28.

Ohio State University Short Course, 45th annual, for arborists, turf management specialists, landscape contractors, garden center operators and nurserymen, Sheraton Columbus Hotel, Columbus, Ohio, Jan. 27-31.

Associated Landscape Contractors of America, 12th annual meeting, Hilton Palacio Del Rio, San Antonio, Tex., Jan. 28- Feb. 1.

Lawn and Utility Turf Management, Three-Day Turf Course, Rutgers University, New Brunswick, N.J., Jan. 28-30.

Penn State Turfgrass Conference, Keller Conference Center, Campus, University Park, Pa., Jan. 28-Feb. 1.

Winter Seminar for Commercial Arborists, Illinois Commercial Arborists Association and the extension service, University of Illinois, Sheraton O'Hare, Rosemont, Ill., Jan. 29.

Virginia Turfgrass Conference, Sheraton Motor Inn, Fredricksburg, Va., Jan. 29-30.

Northern California Turfgrass & Environmental Landscape Exposition, 10th annual, San Mateo County Fairgrounds, San Mateo, Calif., Jan. 30-31.

Golf and Fine Turf, Three-Day Turf Course, Rutgers University, New Brunswick, N.J., Jan. 30-Feb. 1.

Penn-Del Chapter, International Shade Tree Conference, annual meeting, Marriott Motor Inn, Philadelphia, Pa., Jan. 31-Feb. 1.

Nebraska Aviation Trades Association, agricultural seminar, Norfolk, Nebr., Feb. 5-8.

Midwestern Chapter, International Shade Tree Conference, annual meeting, Stouffer's River Front Inn, St. Louis, Mo., Feb. 5-7.

American Sod Producers Association, winter conference, Ramade Bourbon Orleans, New Orleans, La., Feb. 7-8.

Golf Course Superintendents Association of America, 45th International Turfgrass Conference and Show, Anaheim Convention Center, Anaheim, Calif., Feb. 10-15.

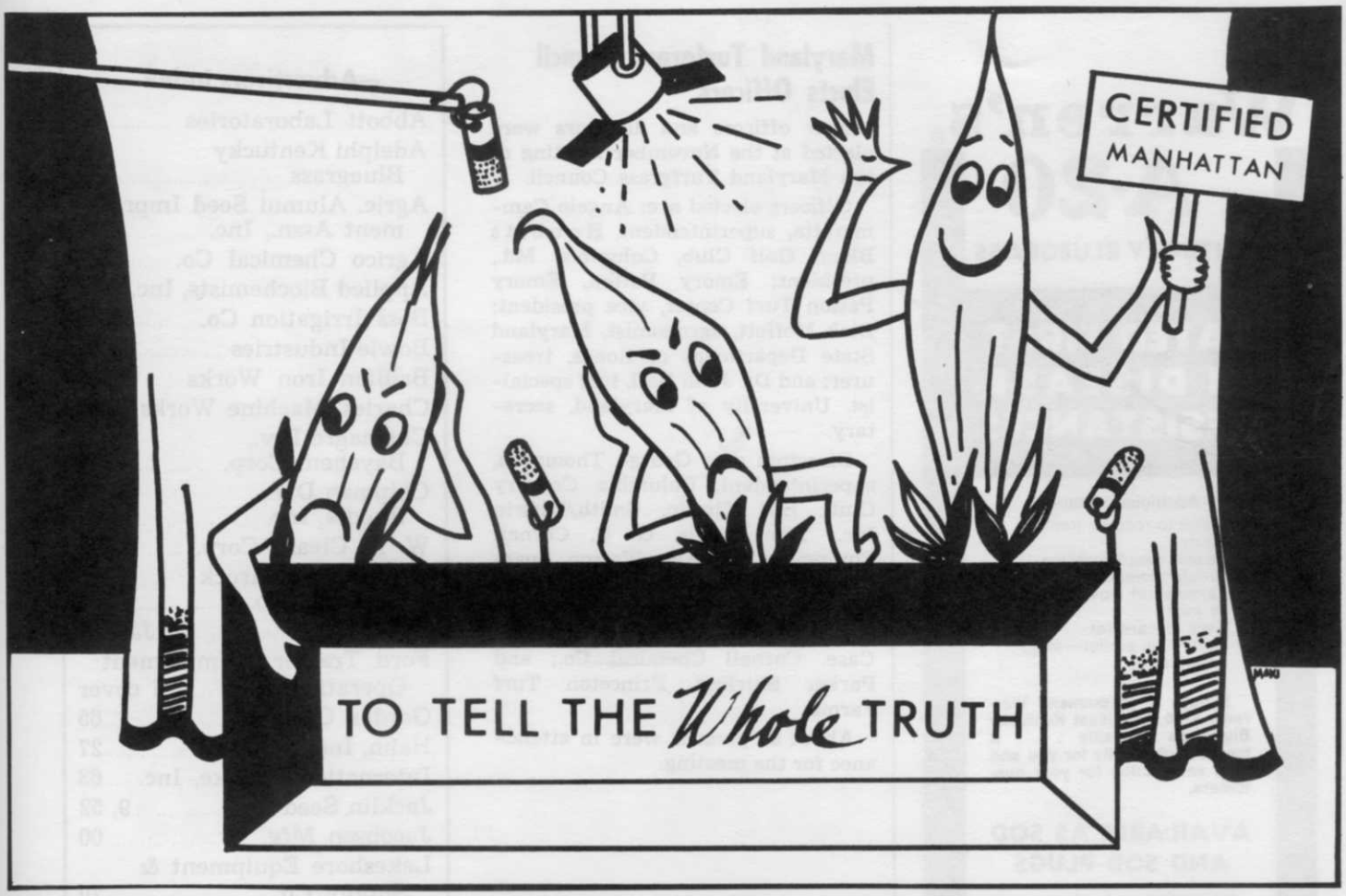
American Society of Consulting Arborists, 8th annual, International Inn, Tampa, Fla., Feb. 14-16.

National Arborist Association, 36th annual meeting, International Inn, Tampa, Fla., Feb. 14-16.

Wisconsin Arborist Association, annual convention, Wausau, Wisc., Feb. 20-21. Contact Jerry Koch, city forester, Courthouse, Wausa, Wisc. for details.

Shade Tree Disease and Insect Short Course, 17th annual, Iowa State University, Ames, Ia., Feb. 20-22. Contact Dr. A. H. Epstein, dept. of botany and plant path., Ia. State Univ. for details.

Park, Recreation and Environment Design, National Symposium, Carleton House, Orlando, Fla., Feb. 25-28.



WILL THE REAL MANHATTAN RYEGRASS, PLEASE STAND UP!

Manhattan perennial ryegrass is a fine textured perennial ryegrass developed by Dr. Reed Funk, Rutgers University. This new, improved, fine textured grass is genetically pure and great care is taken by Manhattan Association growers who plant only foundation seed stock. The seed is produced by members of the Manhattan Ryegrass Growers Association who agree to strict rules of growing, to protect the crop from cross-pollination and other contaminants.

The seed produced by these growers is closely watched and both field certification and seed certification are required before the seed is released to you, the customer.

Any seed bearing the name "Manhattan" but which does not carry certification tags may not be truly Manhattan. The variance could be drastically untrue of variety.

For your protection — buy only Certified Manhattan; why take a chance on imitations?

THE Manhattan®

"TURF TYPE"
PERENNIAL RYEGRASS

Certified Manhattan is grown by the
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WHITNEY-DICKINSON SEEDS, Inc.
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Warren's®

A-20

KENTUCKY BLUEGRASS

RATED FIRST IN DISEASE RESISTANCE!

Additional Features:

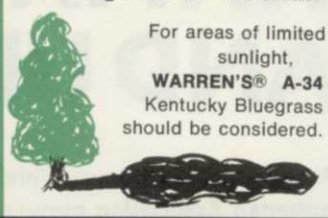
- Quick to recover from injury
- Resists weed invasion
- Drought tolerant
- Takes short mowing down to ½ inch.
- Easy to care for
- Greens up earlier—stays green longer.

It pays to recommend Warren's A-20, the finest Kentucky Bluegrass available . . . it means high profits for you and total satisfaction for your customers.

AVAILABLE AS SOD AND SOD PLUGS

Descriptive color brochure available!

Having a Shade Problem?



For areas of limited sunlight, **WARREN'S® A-34** Kentucky Bluegrass should be considered.

WARRENS LAWN FOOD

Used to fertilize the turf of Warren's Turf Nurseries, the worlds largest grower of fine lawns. Still a full 50 lb. bag

Backed by newspaper campaign in all major markets.

Warren's

TURF NURSERY

8400 West 111th. Street
Palos Park, Illinois 60464
Phone 312/974-3000

Maryland Turfgrass Council Elects Officers

New officers and directors were elected at the November meeting of the Maryland Turfgrass Council.

Officers elected are: Angelo Cammarotta, superintendent, Hobbits Blenn Golf Club, Columbia, Md., president; Emory Patton, Emory Patton Turf Center, vice president; Dick Moffett, agronomist, Maryland State Department of Roads, treasurer; and Dr. John Hall, turf specialist, University of Maryland, secretary.

Directors are: George Thompson, superintendent, Columbia Country Club; Bill Kirwin, Smith/Kirwin Inc.; Tom Harris, G. C. Cornell Equipment Co.; Alex Watson, Sparrows Point Country Club; Frank Stephens, agronomist, Operators Heat Lawn Maintenance Firm; Cliff Case, Cornell Chemical Co.; and Parker Shirling, Princeton Turf Farms.

About 50 persons were in attendance for the meeting.

Club Car Of Augusta Ga. Acquired By John-Manville

Club Car, Inc. of Augusta, Ga. has been purchased by John-Manville Corporation for an undisclosed amount of cash, according to a joint announcement.

Club Car, Inc. engages in the manufacture and marketing of electric golf cars and resort vehicles.

Annual sales by Club Car, Inc. during the past twelve months were in excess of $2 million. Primary markets include golf courses and resorts.

William P. Stevens, Jr., President of Club Car, Inc., and other officers and employees will remain with J-M as part of the company's agri-turf business.

Seventy-five personnel are presently employed by Club Car, Inc. in Augusta.

Serving worldwide markets, J-M is a major manufacturer of fiber glass, industrial specialties, construction materials, commercial and industrial insulations and pipe and a miner and supplier of asbestos, diatomite, perlite and talc. J-M operations also include lighting fixtures and components, real estate and land development, and environmental control products and systems.

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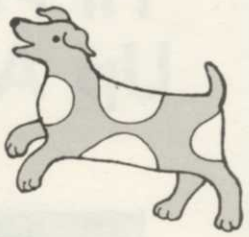
Now there's a way to protect the dog who chases the cat who catches the bird who eats the worm who lunches on a leaf sprayed with insecticide!



DIPEL... kills leaf-eating caterpillars as effectively as chemical insecticides, yet is uniquely safe. Won't harm humans, pets, beneficial insects, birds or wildlife.

It isn't easy these days to keep everybody happy. You have to protect trees from destruction by defoliating caterpillars . . . but do it in a way that doesn't endanger other elements of the environment.

DIPEL can solve your *caterpillar* problems without causing *other* problems, including "public relations" problems! DIPEL is a highly selective, biological insecticide. The active ingredient *(Bacillus thuringiensis)* is a naturally occurring organism. For thousands of years it has been killing leaf-eating caterpillars but leaving desirable creatures alone.

DIPEL®

Use DIPEL to control a wide range of worms . . . Gypsy Moth, Cankerworms (Inchworms), Webworms, Spanworm, Tent Caterpillars, Bagworms and many others. Put some "peace of mind" into your 1974 spray programs. Specify DIPEL . . . wherever you need effective worm control *and* safety!

It's never been tougher to be a worm.

AGRICULTURAL AND VETERINARY PRODUCTS DIVISION
ABBOTT LABORATORIES, NORTH CHICAGO, ILL. 60064

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I'll Put My LESCO Quality Parts Up Against Toro's and Jacobsen's Anytime—Anyplace

I can save you up to 50% on replacement parts to fit Toro and Jacobsen greens and fairway gang mowers. I take pride in our LESCO parts and have made every attempt to build the finest quality product on the market today. I guarantee LESCO parts to be equal or superior to the parts you are presently using from the original equipment manufacturers. If for any reason you are not satisfied with LESCO parts after a fair trial — call me personally — I WANT to know about it. (216-651-1600)

Sincerely yours

James Fitzgibbon
President

P. S. I'll be in Booth #**H-71** at the 45th International Turfgrass Conference in Anaheim, California. Stop and compare our LESCO parts and tires in person.

LESCO PRODUCTS is a division of Lakeshore Equipment and Supply Co. of Cleveland and Bloomingburg, Ohio. We are manufacturers, formulators and distributors of parts, chemicals and fertilizers serving the golf course and green industry markets.

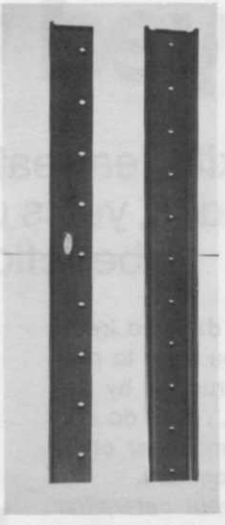
COMPARE! (Check your latest invoice and fill in.)

1. LESCO single edge bed knife $10.95
   fits Jacobsen fairway mower _____
2. LESCO double edge bed knives $12.95
   fits Toro fairway mower _____
3. LESCO single edge bed knife $11.50
   fits Roseman fairway mower _____

(ALL AMERICAN MADE — GUARANTEED)

We stock thousands of the 150 primary wearing parts of Toro and Jacobsen greens and fairway gang mowers. Over 10,000 bed knives are now in stock awaiting your order. We will process your order the day it is received.

All manufacturers' names, numbers, symbols and descriptions are used for reference purposes only, and it is not implied that any part listed is the product of these manufacturers.



For more information mail this coupon or call collect. Telephone (614) 437-7337

LESCO PRODUCTS — Division Lakeshore Equip. & Supply Co., W. Main St., Bloomingburg, Ohio 43106

Name ..... Title .....

Affiliation .....

Street .....

City ..... State ..... ZIP .....

Please send me a parts and price list for ordering LESCO products.

— classifieds —

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

Rates: "Position Wanted" 10¢ per word, minimum $3.00. All other classifications 20¢ per word, minimum $4.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment. Boldface rule box: $25.00 per column inch.

HELP WANTED

GREAT OPPORTUNITY FOR THE MAN WHO LIKES TO BE HIS OWN BOSS!

National leader in tree service, operating from Maine to Florida, offers excellent opportunity in sales and management. Ability to work with public and personnel is important. Must be experienced in tree work or horticulture. Excellent starting salary, expenses and fringe benefits. Intensive training course and outstanding growth potential. Send resume of experience or educational background to:

WILLIAM ECKHARDT
BARTLETT TREE EXPERTS
2770 Summer Street, Stamford, Conn. 06905

GENERAL FOREMAN for tree service company in Rochester, N.Y. Experienced, active and imaginative person to organize and supervise 8-12 tree service crews (approx. 85 men). MUST HAVE proven background to lead an inspire men to work efficiently. Knowledge of tree work helpful, but not essential. Year-round salaried position. Company vehicle furnished. Hospital and pension benefits. Reply to: Mr. Robert G. Hooper, Monroe Tree and Landscape, Inc., 225 Ballantyne Rd., Rochester, N.Y. 14623. Phone 716 436-2900.

DISTRIBUTORS for D. J. Andrews, Inc. stump cutter teeth, pockets and bolts. Best wholesale and retail price in U.S.A. Add to this exclusive area, local advertising at our expense, etc., and you have our story. D. J. Andrews, Inc., 17 Silver St., Rochester, N.Y. 14611. Call 716 235-1230, or 716 436-1515.

SALESMAN-SUPERVISOR for Tree Department B. S. plus minimum 5 years experience. Hospitalization, vacation, pension, company car, salary plus commission. Heyser Landscaping, Inc., 400 N. Park Ave., Norristown, Pa. 19401.

PERSON TO SUPERVISE harvesting operations for large grower in Ohio. Duties include sales and service work. Reply giving details of experience and salary requirements to Box 110, Weeds Trees & Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

SALESMAN WANTED to cover Connecticut and New York selling shade tree chemicals, agricultural chemicals. Write Box 106, Weeds Trees & Turf, 9800 Detroit Avenue, Cleveland, Ohio 44102.

SEEDS

SOD QUALITY MERION SEED for discriminating growers. Also Fylking, Delta, Park, Newport, Nugget and Pennstar bluegrasses as well as fine fescues. We will custom mix to your specifications. Michigan State Seed Company, Grand Ledge, Michigan 48837. Phone 517 627-2164.

CROWNVETCH SEED: Penngift and Chemung varieties. Direct all inquiries to: Walter C. Mehlenbacher, Castile, New York 14427. Phone 716 493-2553.

POSITION WANTED

POSITION WANTED: Golf course construction field. Engineering degree and registered professional engineer. Ten years experience in golf course construction. Write Box 111, Weeds Trees & Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

FOR SALE

DOUBLE EDGE sod cutter blades. Will fit any Ryan sod cutter. Works like double edge razor blade. Cuts much more sod per blade. Made to bolt on both ways. $24.00 plus postage. New automatic sod loaders for direct loading to pallets, trucks or trailers. No workers needed on ground. Both products developed and designed by Hadfield. Write or call Glen Hadfield, 4643 Sherwood, Oxford, Michigan 48051. Phone 313 628-2000.

FOR SALE: Complete tree Service Company, located on West Coast, gross $200,000.00 per year. Year round work. New spray rig, 3-2 ton dump trucks, 3-4 wheel drive pickups, 2 winch trucks, 3 chippers. Several other pieces of equipment. Box 180, Weeds Trees & Turf, 9800 Detroit Avenue, Cleveland, Ohio 44102.

A GOING BUSINESS (tree surgery) southeastern Massachusetts. This business has all the needed equipment in excellent condition. Financing will be arranged. Owner will stay 3 years maximum to help. Selling because of health. Box 112, Weeds Trees & Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

CHAIN SAW CHAIN, bars, sprockets, sharpening equipment, saw parts and accessories. Save to 40%. Professional quality, fully guaranteed. World's largest mail order supplier of this equipment. Free catalog. Write Zip-Penn, Box 43073-A68, Middletown, Ky. 40243.

ARPS stump cutter teeth, top quality and best price in U.S.A., D. J. Andrews, Inc., 17 Silver St., Rochester, New York 14611. Call 716 235-1230.

MISCELLANEOUS

TREE APPRAISALS, SURVEYS, loss evaluations and expert consultation services. For names of members of the American Society of Consulting Arborists, Inc., throughout the country, contact: Executive Director ASCA, 12 Lakeview Ave., Milltown, New Jersey 08850.

GOLF COURSE GREEN DESIGNS, complete, $35.00 each. For more information write Golf Course Specialty, 330 Cicero Ave., San Antonio, Texas 78218.

USED EQUIPMENT

FOR SALE Jacobson F-133 5 gang, 11 ft. cut self contained Reel mower. 450 actual hours, reels sharpened and lapped, mechanically perfect, very clean $2850.00; 1 year old. All steel 8x12 ft. contractors truck bed, perfect $600.00. 4 month old Yazzo 76 inch, 2 cylinder 18 horsepower Rotary mower, perfect $1750.00. Deliver free 300 miles of Chicago, reasonable over 300 miles. T. C. Nelson, RR2, Box 134, Beecher, Ill. 60401. 312 946-2133.

BASKET TRUCK — 55 ft. working height. 1973 Elliott with boom mounted 8,000 lb. wench. Used 2 months. Truck is 1973 Chevrolet — 2 speed rear end with 1600 miles. Not even broke in yet. Price $20,000.00. Robbin's Tire Service, 404 Caroline, Creve Coeur, Ill. 61611. Phone 699-7920.

FOR SALE: Sprayers: used and new—Hydraulic and mist, all makes. Reconditioned pumps — Bean Royal 20, 35, and 55. Used Rotomist parts. Phone: Normandy 2-3507 or write: Ralph McFarland, 209 Pleasant Place, Ann Arbor, Michigan 48104.

LARGE vac and wagon, self-unloader, excellent for leaves or grass clippings, Rodger's (720E) sweeper, fine turf roller, new, Ideal (903) reel grinder, save on these bargains. Beauty Lawn Sod, 603 Union Rd., R2, Lebanon, Ohio 45036.

SKYWORKER, 55 ft. reach model 1040-C, factory mounted on 1965 Chevrolet 2 ton, operates off truck engine or pony motor, compressor and holding tank, dual buckets, $12,000. Call evenings, Area Code 303 382-7000.

ROTOMIST MODEL 100E, 1955 100 gallon Willys industrial 4-cycle engine excellent condition asking $500.00, for information write: Elmhurst Park District, Supt. of Parks, 225 Prospect Ave., Elmhurst, Ill. 60126.

FOR SALE: One Asplundh chipper and chipper truck complete ready for work, good condition. 5th Ave., RD3, Devonshire, New Jersey. Phone 609 645-2106.

STONE PIX Stonepicker, excellent condition, price $750.00. Write or call The Wadsworth Company, Van Dyke Rd., Plainfield, Ill. 60544. Phone 815 436-6648.

WANTED — Used Ryan sod harvester. Reply giving condition and price to Box 109, Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

"BIG J" sod harvester, excellent condition. 5 Ryan sod cutters, C-9 models 18". Frank Deak's Sod Farms, R1, Union Grove, Wisc. 53182. Phone 895-2446.

WANTED TO BUY

WANTED — Landscape, nursery, or horticultural business. Gross sales must exceed $100 M. Write Director of Finance, 36199 Mound Rd., Sterling Hts., Michigan 48077.

COMING NEXT MONTH
WEED CONTROL
WHERE IS THE MARKET

trimmings

WASH, RINSE AND SQUASH is a new twist on the Rinse and Drain procedure with chemical containers. A new tool, called Posi-Drain, makes the difference. It looks a little like a punch and a can opener rolled into one. As recommended, rinse and drain the container twice. Then a simple wrist action of the tool punches a hole in the top of the container. A third rinse is drained through the puncture. Last, puncture the bottom of the can. Posi-Drain is nine inches long and weighs about ⅓ pound. Current design is for one and five gallon cans. Write: B. W. Norton Manufacturing Co., Oakland, Calif.

WOOD CHIPS AND WASTE materials are now being experimentally combined. The result hopefully is a fertilizer and soil conditioner that will strike the public fancy. The Maryland Environmental Systems is sandwiching wood chips and sludge from Washington D. C. They lay a layer of chips down, cover it with sludge and mix two or three times a day for 15 days. The mixture is then screened and the dried sludge is piled for 30 days to let the aerobic and anareobic bacteria do their job. The mixture appears much like organic matter which has had a shot of fertilizer added.

TRACTOR ACCIDENTS and age of operator have a lot in common, according to the National Safety Council. In a recent survey, results showed that 48 percent of the tractor accidents were accounted for by operators in the 15 to 44 years age bracket. Those between 25 and 64 years racked up a total of 57 percent of the accidents; these operators are those who regularly drive tractors. USC says that 91 percent of all tractor injuries happened while on the job.

SIXTY PERCENT of the projected chain saw market in 1974 will be recorded in professional and farm sales, according to Frank McDonald, Pioneer product manager. Speakiing to about 75 Pioneer distributors he estimated that the casual and professional chain saw market in North America was a projected $250 million. "Suburban growth is having a significant impact already on casual chain saw sales," he said. "Seventeen markets alone in the United States have increased their suburban populations by more than 50,000 persons in the last two years. The suburban homeowner is an important potential buying influence."

OREGON'S BOTTLE BILL is making a hit within the Environmental Protection Agency. EPA reports that as long a result of the law in Oregan, can and bottle litter along the state's roads has been reduced by a maximum of 81 percent in the winter months of 1972-73 as opposed to the same period in 1971-72. What's the law entail? It requires a minimum two-cent refund to purchasers on the return of beer, malt beverage and carbonated soft drink containers acceptable for re-use by more than one manufacturer and a five cent refund on soft drink and beer containers acceptable to only one manufacturer. EPA has much more to say about the results of this law. Send for the pamphlet "Oregan's Bottle Bill: The First Six Months" by writing: Solid Waste Educational Materials Control Section, Environmental Protection Agency, 5555 Ridge Ave., Cincinnati, Ohio 45268.

DIAL-AN . . . ANSWER is the newest and hottest consumer service available to the public on lawn care problems. It's part of the O. M. Scott & Sons clever idea to be of greater service to its customers. Scotts has sent out direct mail information to its clients about the new service. You can call toll free and talk to a friendly, sympathetic expert. In Ohio dial 800-762-4010. In California dial 800-772-2426. In Washington, Utah, Oregon, Colorado, Idaho, Nevada, Montana, Wyoming and Arizona dial 800-227-0333. All other states dial 800-543-1415.

MICROWAVE WEEDING is the latest type weed control to be tested and demonstrated in Texas. Known as the Zapper, a machine was built in cooperation with the Oceanography International Corporation, Texas A&M University, the Texas agricultural experiment station and the USDA agricultural research service. The Zapper slays weeds by applying microwaves directly to the soil. It gets the weeds . . . and fungi, and nematodes, and soil insects, and anything else which happens to get in the way. OIC preident John Hughey says that the system is safe, nonpolluting, and provides long duration control of weeds and soil-borne pests. Zapped soil is immediately ready to be seeded, with no concern for toxic residues. The big plus is in increased yields. Hughey reports that cantaloupes and onions planted in zapped soil jumped their yields 35 to 60 percent over those in hand-weeded plots.

OHIO STATE UNIVERSITY has developed a noise meter which makes instant readings of sound levels and also accumulates the "dose" for daily readouts. The meter is about the size of a pack of cigarettes. Currently, only experimental models exist.

PLANT RESPONSE to increased ultraviolet radiation intensities will be studies by scientists of Utah State Univ. USDA has granted $79,000 to the university to determine the interaction between ultraviolet radiation and air pollution, investigate the effect of increased ultraviolet radiation and temperature stress on selected plants and determine whether more irradiation increases plant susceptibility to disease pathogens.

CHECK THE LOCAL IRS office if you have temporary employees who earn less than $2050 for the year. If this is the case, wages may be tax-free and the employee can avoid taxes being withheld by filing Form W-4E with the employer.

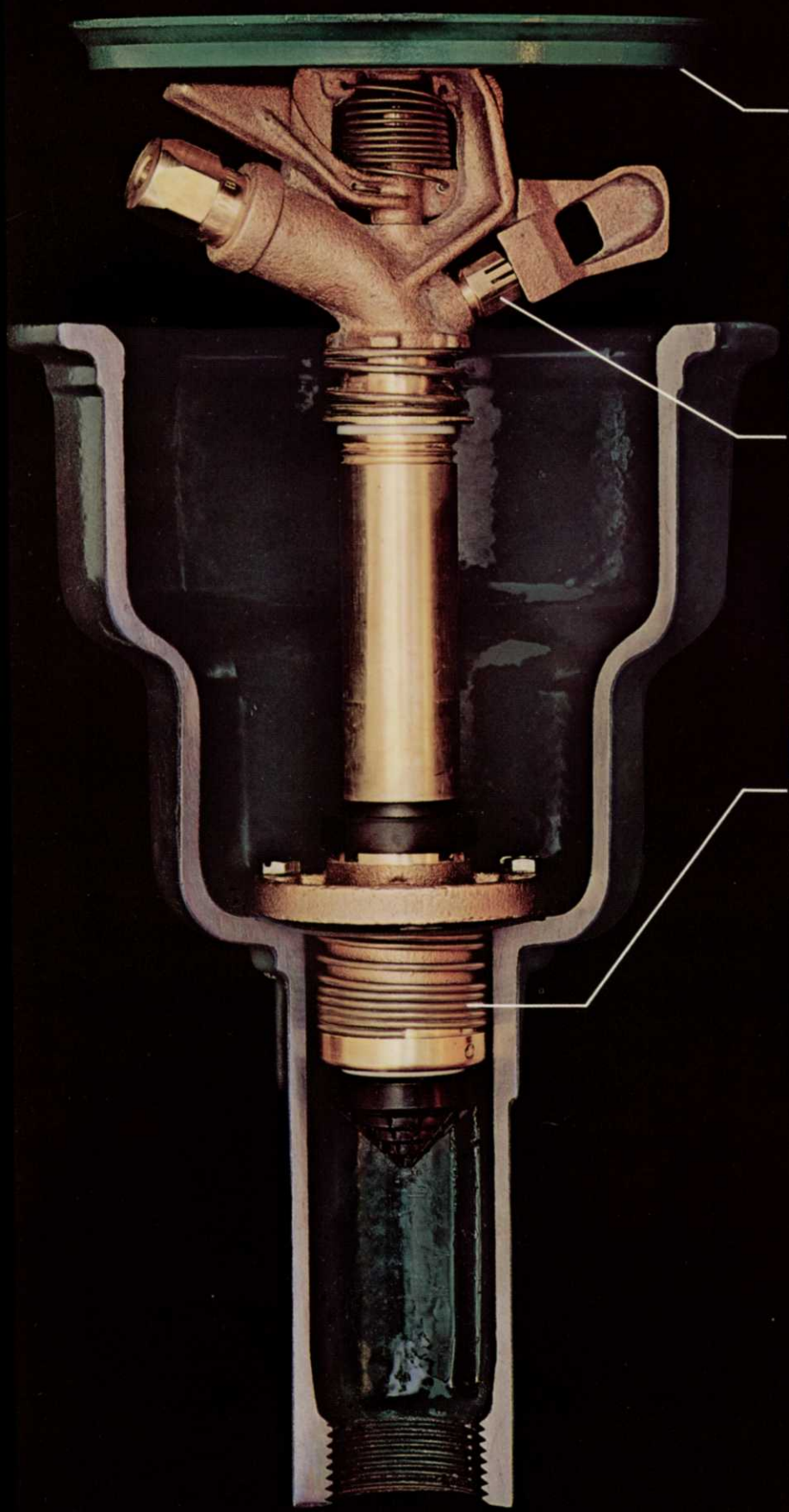
HOW YOU SPRAY DOES MAKE A DIFFERENCE is the title to a set of 75 slides produced by the H. D. Hudson Company. It could be used as a training aid or in a talk given to a service club or garden club. Write the company at 154 East Erie Street, Chicago, Ill. 60611.

THE SAME PRODUCT that controls scours in baby pigs has been found to control lethal yellowing disease in south Florida's coconut palms. Terramycin, an antibiotic, has shown 100 percent success in controlling the blight which has swept through the palm population. Tests have proven that the lethal yellowing disease is caused by a mycolpasma, a living cell that is neither a virus nor a bacteria. Terramycin has been injected into the trees through a hollow lag bolt and under pressure.

THE FOREST SERVICE says that by the end of 1976, owners of off-road vehicles will have designated areas and trails in the National Forests System lands where they may and may not operate. The Forest Service has begun a three-plus year process to establish controls over use of off-road vehicles on all 187 million acres of national forests, grass lands and other lands.

For More Details on Following Page Circle (109) On Reply Card
For More Details on Back Cover Circle (125) On Reply Card

And the green grass grows all around



Anyone can show you lush, green grass—on someone else's course. Rain Bird shows you the exclusive features of our Pop-up Sprinkler, Model 51, that let you grow your own. For instance...

The highest pop of any sprinkler (2-5/16"). Grass can't distort the distribution pattern. You get uniform growth—no dry rings or wet spots.

Special nozzle features assure a tight, wind-resistant stream for longer throw and equally efficient close-in watering without puddling. That means even growth throughout a greater area.

Positive retraction spring prevents heads from sticking up—a hazard to mowers and sprinkler heads. There's no danger of missed waterings or cuttings.

Positive seal features mean maximum pressure through the nozzles—with easy accessibility of parts promoting faithful maintenance.

Don't settle for pretty pictures. With Rain Bird at work, you can see all the lush, green grass you like. It grows all around—all around your course.

RAIN BIRD®
Glendora, California 91740

Sometimes it's better to hear it from someone else...

Here's what Berkley Carter of Tuckahoe Turf Farms,* Slocum, R.I. has to say about

baron KENTUCKY BLUEGRASS

U.S. Dwarf Variety Plant Patent No. 3186

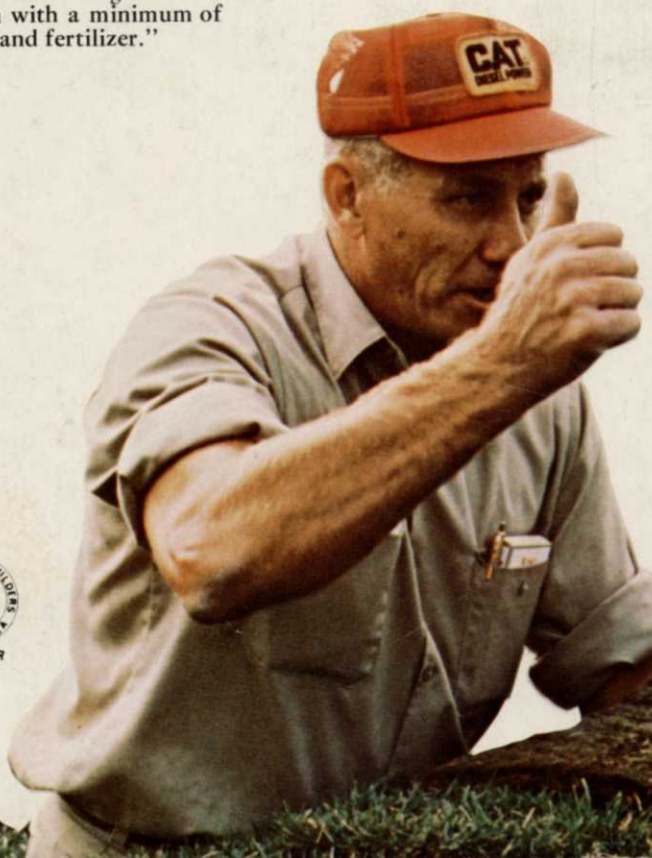
"I use Baron for every acre of bluegrass I grow. Baron gives what you guys call in your advertising. . . a tight-fisted root system. It holds together. . .I can shake it like a rug."

"Of all the bluegrasses, Baron is resistant to more diseases. I've had two different bluegrass fields side by side and Baron always shows more resistance. It holds up its color throughout the season with a minimum of water and fertilizer."

"When I need a herbicide, Baron can take the shocks better without streaks or setbacks. It is an aggressive grass needing only minimum maintenance practices."

"Baron comes up fast. . . that's important to me. I want to see fuzz in 7 days so that the soil is protected as soon as possible."

"It's hard enough getting the seedbed ready; I'm not going to spoil everything with a poor quality seed. I don't know why every sod grower doesn't use Baron."



"And your Jamestown Fescue is great too."

Jamestown is perfect for a bluegrass blend, particularly Baron. It has great eye appeal and when sod is needed for sun and shade areas Jamestown/Baron really go well together.

One more comment from Berkley. . . *"When you've got a good thing going – stick with it."*

There's not much more we can add except that Lofts Pedigreed Seed Company or any authorized distributor is nearby wherever you grow sod.

Exclusive North American Grower and Distributor:

Lofts
Pedigreed Seed, Inc.
Bound Brook, N.J. 08805 / (201) 356-8700

*Tuckahoe Turf Farms, growers of 600 acres of cultivated sod, is one of the largest sod farms in New England.

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